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PROCEEDINGS OF SOCIETIES.

FOURTEENTH ANNUAL MEETING OF THE KANSAS ACADEMY OF SCIENCES.

TOPEKA, KANSAS, NOVEMBER 9TH, 10TH AND 11TH, 1881.

The business meeting was held at the office of Dr. A. H. Thompson, at 3:00 o'clock P. M., November 9th. After a little routine business the meeting adjourned until 7:30 o'clock P. M.

The Academy assembled at 7:30 o'clock in the Senate Chamber, and was called to order by the president, Prof. J. T. Lovewell, of Washburn College. The speaker for the evening, Prof. E. N. Plank, was introduced. His topic was "Botany Popularly Considered." The vast coal beds, the speaker stated, were the remains of primeval vegetation. Plants and trees have in all ages been regarded with remarkable superstition and reverence. Trees speak and teach many lessons. Men are now living who believe that a forked switch of hazel can determine the current of water many feet beneath the earth's surface. There are men who, like the swine, enjoy things which are pleasant to the taste and sight without learning anything of their nature, or even their names. Some acquaintance with nature may be gained by all to their profit. The vegetable kingdom is the great food-providing agency of the world. It may be somewhat difficult to give a set of definitions that would distinguish the plant from the animal kingdom, but this is owing to the minuteness into which both kingdoms descend. The movements of plants, such as twining and the leaves following the course of the sun, is power which must be in the plants themselves. The leaf of the Venus

Fly-trap closes so rapidly on its victim as to almost invariably secure it; then opens in readiness for another unwary insect. Evolution at present is only a thing, and whether a sufficient number of parts can ever be accumulated to prove it, remains to be seen. The vegetable kingdom by its growth, purifies the atmosphere and renders animal life impossible. Animals can live only on the organized matter which plants produce. Carbon, which in some of its forms is coal, diamond, etc., is the chief element of vegetable construction. Plants elaborate all the food from the mineral kingdom upon which men subsist, and therefore it is literally true that "all flesh is grass." The study of botany or any branch of natural science is an excellent system of training for the mind. The science of botany presents an ample field for research, and the period of a man's life is far too short to go over all. Science has failed to explain why one extremity of the young plant grows from the light and contrary to the laws of gravitation, while the other shoots upward in the air. It has also failed to explain why sap flows and rises in the trees; also why the same soil can produce plants of such diversified natures as the night shade, rose, etc.

At the conclusion of the lecture Prof. Lovewell announced the lecture for the following night, and the Academy adjourned to meet at the same place at 9:00 o'clock A. M. Thursday.

The programme of Thursday opened with a paper from Prof. Carruth on "Genesis and Geology." He fails to reconcile the records of the Mosaic and geological history of the creation, and finds differences that he thinks will be set aside by a fuller knowledge on the subject.

The second paper was by Joseph Savage, on the "Agate Beds of Trego County." The agate beds of Trego county, Kansas, were compared with the chalk nodules in English strata, and much difference found in the character of their values or concretions and he thinks they were from different causes. The matrix contains no fine lime, but is composed of silicate of alumina. Some of the agates are on the carnelian type, others opalized. The principal agate bed in Trego county is found near Collier Station, and in a square of about two rods. Other inferior beds are found in the counties north and east of there. The agates are generally associated with jasper. This jasper shows the approach to the agate form in dendritic impression. The paper was illustrated with a great many specimens that Prof. Savage had secured.

"Preliminary Stages of a Leaf-eating Lady-bird," by Prof. Popenoe, of Manhattan, followed. The professor stated that while he was spending a few days in collecting in Colorado, he happened at Trinidad during the early part of August, and in collecting near that town found a species of *Epilachna* that he then thought to be new. It attracted his attention by its abundance and by its habits, which, like those of our northern lady-bird, *Epilachna borealis*, so strongly separate this genus from the allied genera of lady-birds. The northern lady-bird in question, as is well known to entomologists and horticulturists, is the only common lady-bird whose habits are strictly herbivorous, the other species of this considerable and widely distributed family being accounted in all stages active

allies to the gardener and fruit-grower from their aphidephagous propensities. The northern lady-bird was known to Fitch, Walsh and other of our older entomologists as being in its larval stages at least an enemy to plants of the cucurbitaceous family, feeding upon squashes and allied plants, often causing considerable loss in the product.

The species concerning which he now spoke is quite evidently an *Epilachna*. Its leaf-eating habits and its appearance point unmistakably to its close relationship to our northern lady-bird. From this it differs, however, in being more woolly, darker bronzed yellow and in having smaller black spots. Less obvious differences exist, but these will not here be particularized.

He gathered from the descriptions of the northern lady-bird, current in entomological literature, that our species resembles this also closely in its larval and pupal forms, it being a prickly, yellowish, humpbacked larva, rather sluggish in movements, like other lady-bird larvæ, and unlike most of them, living upon the tender parenchymatous portion of the leaves of plants. Our Colorado larva feeds upon the bush bean. The specimens were gathered in a garden where they were feeding on beans in great numbers. The larvæ were found principally on the under side of the leaves, and devouring the green portions, they left the woody net-work nearly clean. The pupa is attached to the leaf by the caudal portion with the larval skin in a roll about the tip of the abdomen. The perfect insects were gathered from the leaves where the larvæ were found feeding, and the only stage in which the beetle was found abundantly was the egg stage.

"Ancient Stone Remains on Summit of Rocky Mountains," a paper by J. R. Mead, of Wichita, was read next. It was as follows:

During the past summer I had occasion to travel over and along the continental divide, which separates the waters of the two oceans, as well as the counties of Gunnison and Chaffee, Colorado, and at a point about four miles west from the town of Monarch, near the head of the South Arkansas, I noticed the debris of very ancient works of stone which, considering their location, were very curious and interesting. They comprised a series of low stone walls, and extending along the smooth summit or backbone of the mountain and connecting two elevated rocky points, about a quarter of a mile apart. On the top of these points were circular enclosures of stone, ten or fifteen feet in diameter, and two feet in height; the walls were made by placing upon edge and leaning together slabs of granite rock, and were originally about two feet or more high and are so ancient that in many places the granite rock of which they were composed had disintegrated, and crumbled into sand. The course of these walls was generally north and south with frequent dips, spurs and angles, side walls and pens, forming an intricate system. The design of it was difficult to comprehend. These marks extended across a convenient top in the mountains, at an altitude of about 11,000 feet, and above timber line. They could hardly have been intended for defence, as the mountain range could be crossed as easily for several miles south as at this point, and I could not see that they would be of advantage in the capture of game. I have heard of such walls on the summit of the mountains further

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north, from several parties; these are the only ones which I observed in my travels. Their origin and purpose may ever remain a mystery. I have implements of stone picked up in that locality.

"Three New Medicinal Herbs Indigenous in Kansas," a paper by W. S. Newlon, of Oswego, was read by the Secretary, Prof. Popenoe, the author being absent. Mr. Newlon in his work among Kansas plants had found three herbs widely distributed in Southeastern Kansas that possessed valuable properties heretofore unknown and unused by the doctors. The botanical names of the herbs are *Helianthella tenuifolia*, *Elephantopus tomentosus* and *Sabbatia campestris*. These herbs are all of a tonic nature and have been thoroughly tested by their discoverer, who claims they are becoming rapidly known throughout the world.

A miscellaneous discussion followed, in which many present particpitated, and then the Academy adjourned to meet at 3 o'clock in the afternoon.

The Academy met at 3 o'clock, the afternoon train bringing in a large number of members and several visitors.

The first paper was by Joseph Savage on the "Leavenworth Coal Mines." He showed the order and thickness of the strata met in boring the shaft, and stated that the lower eight feet of the shaft was impregnated with gas and contained many fossils in the finest possible state of preservation.

"The Analysis of Drinking Water" was the title of a paper by Prof. G. H. Failyer, of Manhattan. The professor had found some very dirty water used for drinking purposes. The sources of contamination were ordinarily cess-pools, barn-yards or kitchen slops thrown near the well, and though the earth for a while might act as a filter it would in course of time become saturated with the impurities and cease to remove them from the water percolating. One instance was given where six persons were attacked with the typhoid fever who had used the water from a certain well, and no others in the neighborhood had the disease. The professor would not say positively that the sickness resulted from the water, but suspected that it did.

The next was a "Description of the Habits and Characteristics of the Mot Mots of Central America," by George F. Gaumer, recently returned from Yucatan, where he has lived for four years, collecting natural history specimens. These interesting birds, he stated, composed the family *Momotidal*, which is peculiar to tropical America, being distributed from Central Mexico to Brazil. They are peculiar in having the cutting edges of the bill serrated. Whence their common English name "sawbills." The central tail feathers are peculiarly deprived of the web for several inches below the tip, leaving a short round portion full webbed at the tip. They live in holes in the earth and lay from four to six fine white transparent eggs. These birds are about the size of bluejays and are brightly colored, forming handsome specimens. The paper was illustrated by sets of the specimens described, with their eggs.

"Visualized Numerals" was the title of a paper by Dr. A. H. Thompson, of Topeka. This is a mental habit, that characterizes many persons, of arranging numbers upon a diagram or picture in the mind so that they cannot think of the

number without thinking of the diagram with the number in a particular place. The diagrams assume a variety of shapes, sometimes symmetrical and sometimes grotesque. The author of the paper is afflicted with the habit of arranging numals in the mind upon a diagram of peculiar shape. The scientists, Dr. Thompson stated, who had investigated the matter found that it was possessed on the average by about one man in thirteen, and one woman in thirty. The paper was illustrated by diagrams.

At the conclusion of the reading each paper was discussed at length and much valuable information brought out in this way.

The Academy adjourned at 5 o'clock to meet at 7:30.

The evening was very disagreeable, but a fair audience appeared to listen to the lecture of Prof. G. E. Patrick, of the University of Kansas, Lawrence, concerning "Chemistry as Related to the Fine Arts." The lecture was well worth hearing. It was written in language that could be understood by the plain wayfaring man, and being delivered in a manner totally devoid of oratorical pretense, was therefore all the more interesting.

The speaker first alluded to the fact that chemistry has its science as well as its art: "why" as well as its "how," and then indicated briefly the manner in which he would consider it, *i. e.*, as a science. He stated that chemistry is a mere youth in years and, perhaps, in attainments, as compared with astronomy and kindred branches of learning, but that it is vigorous and progressive and while not comp'eted has greatly benefitted the world, even in its crudity. Reference was then made to the noble labors of Liebig in connection with agriculture, and the progress of his studies among fertilizing agents was detailed in a graphic manner. The professor next next touched upon the history of soda; how at the end of the last century it was scarcely known, its sources of supply being limited, but finally, in 1789 how they were enlarged by LeBlanc, who discovered a method by which sodium carbonate could be produced from common salt. The iron industry was cited as affording a striking example of the benefits accruing to the world from scientific research. Before Bessemer discovered his process of making steel twenty days were occupied in doing what can now be done in that number of minutes, and while then but two-pound bars could be treated, now masses of six tons weight are converted into steel and steel bridges, and rails made possible.

The art of dyeing, although practiced, in one sense, from time immemorial, had been given a high rank because of the efforts of the patient searchers among the "$H_2 S O_4$"'s of the universe. Particularly, said the speaker, is this true as regards the production of aniline dyes from coal tar, and the adoption of that beautiful invention by which ultramarine is made from pine shavings. Artificial stone and cement were cited as examples of science creating useful substances and the recent conversion of base earth into sapphire and rubies by two eminent French chemists in 1879, as showing that things of beauty and joy forever were not lost sight of.

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Professor Patrick closed by giving a glimpse of that portion of the subject suggested by his theme which he had not time touch upon, and predicting for chemistry a future even more wonderful than its past. The lecture was an apt and timely statement of the utilitarian side of science and as such deserves a much wider hearing than it was granted last evening.

On Friday morning, November 11th, the Academy met at the Senate Chamber. The officers for the ensuing year were selected as follows: President—J. T. Lovewell, of Topeka; Vice-Presidents—Joseph Savage and J. R. Carruth, of Lawrence; Secretary—L. A. Popenoe, of Manhattan; Treasurer—R. P. Brown, of Leavenworth.

The committee on the Mudge monument fund reports that enough money for the monument had been received, leaving a balance to be devoted to the improvement of the grounds of Manhattan where the monument is to stand. $600 was the amount raised.

Col. Wm. Tweeddale, of Topeka, then read a paper on "The Importance of Water as Affecting its use for Mechanical Purposes." The principles underlying the study of the subject were discussed. He considered the inorganic impurities as sulphates and carbonates, and spoke of their disadvantages in mechanical uses, and also mentioned a means of purifying alkali water.

"The Salt Wells of Wichita," by J. R. Mead, was next. He stated that a shaft at Wichita was started for coal but failed to reach it and found salt instead. The county of Sedgwick lies in the Permian or the upper carboniferous formations. The first fifty feet of the shaft passed through a gypsum bed, the following 200 through clay, slate and limestone containing fossils. The next stratum was saturated with oil, burning readily. The next stratum was strongly salt, and salt water was found just below this, which rose 150 feet in the shaft. The drill has gone to a depth of 1,100 feet, passing a strong vein of brine, free from impurities and containing as much salt as any in the State. They expect to reach coal at a depth of 2,500 feet, and in case of failure to find coal intend to manufacture salt on a large scale.

"Igneous Rocks, of Kansas," by Robert Hay, was read by the author. The principal object of the paper was to call attention to the metamorphic deposits in Woodson county, which he stated furnished all the evidence of metamorphic action. He had specimens of amethyst, beryl, quartz and mica, from the locality mentioned, as well as many specimens of various rocks in whose formation igneous action must have taken an important part. In the discussion following the reading of the paper Prof. Snow stated that the action of the heat and water might be considered sufficient to account for the phenomena described. In this conclusion Prof. Mudge, deceased, is said to have agreed. Prof. Snow thought heat could not act as an agent here. Thought a much more full study of the locality must be made before a final decision could be reached. Prof. Failyer agreed with Prof. Snow, forming his opinion from the study of the Cherokee and Joplin lead regions.

Geo. S. Chase's paper on a "Preliminary List of Kansas Invertebrate Fossils" was read by title, the author being absent. It will be published in the proceedings.

Prof. H. S. S. Smith, of the State University, read a paper on "The Constitution of the Sun."* He described the rotation of the sun, its superficial appearance under high power of the telescope and the appearance and modification of the sun's spots. The spectroscopic appearance shown in the examination of the sun's spots, prominences and corona were described. The last he stated to be of unknown extent, origin and composition. Among other things he stated that the radiant energy of the sun's heat equals 10,000 horse-power to each square foot of its surface. The theory of the writer of the essay was that the body of the sun was in a gaseous state.

Mr. S C. Mason, of Manhattan, presented a list of Riley county fossils, and stated that rocks of the county belong to the Permocarboniferous and furnish a great variety of fossils. The list names fifty-seven species belonging to several classes, and gave distribution and other interesting data.

The Academy then adjourned to meet at 2 o'clock.

The first production of the afternoon was "A Visit to the Mammoth Cave," by Prof. Lovewell. The essay was a very interesting description of a trip through that cave, made by the Professor last summer.

Prof. F. H. Snow, of State University, described his archæological explorations in the Pecos Valley, New Mexico, where he, with several others encamped for one week last summer. They first began excavations on the site of the old Pecos church, but were stopped by the priests. They had dug a shaft about five and one-half feet down, however, and found a coffin and a few bones and a portion of clothing. A few feet below they found a fire-place and indications of fire of long standing. Still further down in the lower layer they found a skull and some pottery, and these relics and some stone implements that they found about the site they brought away with them. On a hill opposite the church they found specimens of pottery of the most ancient type, and also specimens of more recent origin. In one locality they found specimens of slag and indications of supposed mining shafts. The supposition was that these were evidences of mining by the ancient Pueblos.

Mrs. Joseph Savage recited an original poem that was very fine. It discussed the agreement of the two revelations of Genesis and geology, in a very happy manner. It was loudly applauded.

Prof. W. M. Crichton, of Topeka, read an essay on "The Physical Basis of Ghosts." The essay was presented in beautiful language and held that the physical basis of ghosts was in the mind of the person who saw them. The paper provoked an animated discussion on ghosts in general.

Prof. Plank, of Independence, Kansas, presented an interesting outline of the flora of Montgomery county, describing the species of plants found there. Many of them are peculiar to that locality and of great interest and beauty.

* This paper appears in the present number of the REVIEW.—ED.

Prof. Sadler, of the State Normal School, presented a short paper on "A Self-Registering Anemeter and Anemoscope."* He described an original electric contrivance for the registry on a paper ribbon of the force and direction of the wind. The appliance of this contrivance to the wind gauge will be a great benefit to meteorological instruments. Prof. Lovewell spoke on the same subject, saying that better modes than those of the present were necessary. He thought Prof. Sadler's appliance a very valuable one, as did Prof. Snow.

The next paper was by Prof. Snow on the natural history of specimens collected by the University Scientific Expedition. They had found a rattlesnake of a very rare kind—in fact the only perfect specimen known—and many lizards of equal rarity. The field of this collection was Socorro township and the mountains west. In five days collecting he had discovered ten new species, and two new genera of butterflies, and many other very rare species. A specimen of the most beautiful beetle known, *Plusiotus gloriosa*, was discovered. Frof. Snow further stated that the band of Indians that came near capturing their party was under the leadership of the same Indian—Nana—that attacked Dr. LeConte in 1851, in the same locality. The Doctor was also bug hunting. Prof. Snow then gave a very humorous and graphic account of the locality and the experience the party had with the Indians, fortunately all getting away alive.

Prof. Geo. M. Stearns, of Washburn College, then presented a brief paper on the desirability of the spelling reform, which led to considerable discussion. On motion the subject was made a special one for the next annual meeting of the Academy.

The following resolution was unanimously adopted:

Resolved, That the Kansas Academy of Science have heard with profound sorrow of the sudden death of Prof. L. A. Thomas, a member of this Academy, well known and honored through the State as an earnest student of science, and a successful teacher of youth. We can only bow in humility at this visitation of Divine Providence by which our beloved fellow-worker has been cut down in the midst of his usefulness and we extend our sympathy to his stricken family.

The Academy then adjourned to meet at the call of the executive committee. The next meeting will probably be held during the holidays of 1882.

In the evening the members of the Academy attended a reception given them by Dr. A. H. Thompson, at his residence, No. 31 West Tenth Avenue. The members all availed themselves of the occasion and enjoyed the evening in a social way very much. Occasionally scientific matters would be discussed *pro* and *con* with a zest and humor that did not destract from the pleasure of all present. Refreshments were bountifully served, and at a late hour the scientists separated, the majority leaving for their homes on the night trains.

* This paper appears in the present number of the REVIEW.—ED.

FIFTY YEARS' PROGRESS IN SCIENCE.

BY SIR JOHN LUBBOCK, PRESIDENT OF THE BRITISH ASSOCIATION.

(*Extracts.*)

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Few branches of science have made more rapid progress in the last half-century than that which deals with the ancient condition of man. When our Association was founded it was generally considered that the human race suddenly appeared on the scene, about 6,000 years ago, after the disappearance of the extinct mammalia and when Europe, both as regards physical conditions and the other animals by which it was inhabited, was pretty much in the same condition as in the period covered by Greek and Roman history. Since then the persevering researches of Layard, Rawlinson, Botta and others have made known to us, not only the statues and palaces of the ancient Assyrian monarch, but even their libraries; the cuneiform characters have been deciphered, and we can not only see, but read in the British Museum, the actual contemporary records, on burnt clay cylinders, of the events recorded in the historical books of the Old Testament and in the pages of Herodotus. The researches in Egypt also seem to have satisfactorily established the fact that the pyramids themselves are at least 6,000 years old, while it is obvious that the Assyrian and Egyptian monarchies cannot suddenly have attained to the wealth and power, the state of social organization and progress in the arts, of which we have before us, preserved by the sand of the desert from the ravages of man, such wonderful proofs.

In Europe, the writings of the earliest historians and poets indicated that, before iron came into general use, there was a time when bronze was the ordinary material of weapons, axes, and other cutting implements, and though it seemed *à priori* improbable that a compound of copper and tin should have preceded the simple metal iron, nevertheless the researches of archæologists have shown that there really was in Europe a "Bronze Age," which at the dawn of history was just giving way to that of "Iron."

The contents of ancient graves, buried in many cases so that their owner might carry some at least of his wealth with him to the world of spirits, have proved very instructive. More especially the results obtained by Nilsson in Scandinavia, by Hoare and Borlase, Bateman and Greenwell, in our own country, and the contents of the rich cemetery at Hallstadt, left no room for doubt as to the existence of a Bronze Age; but we get a completer idea of the condition of Man at this period from the Swiss lake-villages, first made known to us by Keller, and subsequently studied by Morlot, Troyon, Desor, Rütimeyer, Heer and and other Swiss archæologists. Along the shallow edges of the Swiss lakes there flourished, once upon a time, many populous villages or towns, built on platforms supported by piles, exactly as many Malayan villages are now. Under these circumstances innumerable objects were one by one dropped into the water;

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sometimes whole villages were burnt, and their contents submerged; and thus we have been able to recover, from the waters of oblivion in which they had rested for more than 2,000 years, not only the arms and tools of this ancient people, the bones of their animals, their pottery and ornaments, but the stuffs they wore, the grain they had stored up for future use, even fruits and cakes of bread.

But this bronze-using people were not the earliest occupants of Europe. The contents of ancient tombs give evidence of a time when metal was unknown. This also was confirmed by the evidence then unexpectedly received from the Swiss lakes. By the side of the bronze-age villages were others, not less extensive, in which, while implements of stone and bone were discovered literally by thousands, not a trace of metal was met with. The shell mounds or refuse-heaps accumulated by the ancient fishermen along the shores of Denmark, and carefully examined by Steenstrup, Worsaae, and other Danish naturalists, fully confirmed the existence of a "Stone Age."

We have still much to learn, I need hardly say, about this Stone Age people, but it is surprising how much has been made out. Evans truly observes, in his admirable work on "Ancient Stone Implements," "that so far as external appliances are concerned, they are almost as fully represented as would be those of any existing savage nation by the researches of a painstaking traveler." We have their axes, adzes, chisels, borers, scrapers, and various other tools, and we know how they made and how they used them; we have their personal ornaments and implements of war; we have their cooking utensils; we know what they ate and what they wore; lastly, we know their mode of sepulture and funeral customs. They hunted the deer and horse, the bison and urus, the bear and the wolf, but the reindeer had already retreated to the North.

No bones of the reindeer, no fragment of any of the extinct mammalia, have been found in any of the Swiss lake villages or in any of the thousands of the tumuli which have been opened in our own country or in Central and Southern Europe. Yet the contents of caves and of river-gravels afford abundant evidence that there was a time when the mammoth and rhinoceros, the musk-ox and reindeer, the cave lion and hyena, the great bear and the gigantic Irish elk wandered in our woods and valleys, and the hippopotamus floated in our rivers; when England and France were united, and the Thames and the Rhine had a common estuary. This was long supposed to be before the advent of man. At length, however, the discoveries of Boucher de Perthes in the valley of the Somme, supported as they are by the researches of many continental naturalists, and in our own country of MacEnery and Godwin-Austen, Prestwich and Lyell, Vivian and Pengelly, Christy, Evans and many more, have proved that man formed a humble part of this strange assembly.

Nay, even at this early period there were at least two distinct races of men in Europe; one of them—as Boyd Dawkins has pointed out—closely resembling the modern Esquimaux in form, in his weapons and implements, probably in his clothing, as well as in so many of the animals with which he was associated.

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At this stage Man appears to have been ignorant of pottery, to have had no knowledge of agriculture, no domestic animals, except perhaps the dog. His weapons were the axe, the spear, and the javelin; I do not believe he knew the use of the bow, though he was probably acquainted with the lance. He was, of course, ignorant of metal, and his stone implements, though skilfully formed, were of quite different shapes from those of the second Stone-age, and were never ground. This earlier Stone period, when man coëxisted with these extinct mammalia, is known as Palæolithic, or Early Stone Age, in opposition to the Neolithic, or Newer Stone Age.

The remains of the mammalia which coëxisted with man in prehistoric times have been most carefully studied by Owen, Lartet, Rütimeyer, Falconer, Busk, Boyd-Dawkins, and others. The presence of the mammoth, the reindeer, and especially of the musk-ox, indicates a severe, not to say an arctic, climate, the existence of which, moreover, was proved by other considerations: while, on the contrary, the hippopotamus requires considerable warmth. How then is this association to be explained?

While the climate of the globe is, no doubt, much affected by geographical conditions, the cold of the glacial period was, I believe, mainly due to the eccentricity of the earth's orbit combined with the obliquity of the ecliptic. The result of the latter condition is a period of 21,000 years, during one-half of which the northern hemisphere is warmer than the southern, while during the other 10,500 years the reverse is the case. At present we are in the former phase, and there is, we know, a vast accumulation of ice at the south pole. But when the earth's orbit is nearly circular, as it is at present, the difference between the two hemispheres is not very great; on the contrary, as the eccentricity of the orbit increases the contrast between them increases also. This eccentricity is continually oscillating between certain limits, which Croll and subsequently Stone have calculated out for the last million years. At present the eccentricity is ·016 and the mean temperature of the coldest month in London is about 40°. Such has been the state of things for nearly 100,000 years; but before that there was a period, beginning 300,000 years ago, when the eccentricity of the orbit varied from ·26 to ·57. The result of this would be greatly to increase the effect due to the obliquity of the orbit; at certain periods the climate would be much warmer than at present, while at others the number of days in winter would be twenty more, and of summer twenty less than now, while the mean temperature of the coldest month would be lowered 20°. We thus get something like a date for the last glacial epoch, and we see that it was not simply a period of cold, but rather one of extremes, each beat of the pendulum of temperature lasting for no less than 21,000 years. This explains the fact that, as Morlot showed in 1854, the glacial deposits of Switzerland, and, as we now know, those of Scotland, are not a single uniform layer, but a succession of strata, indicating very different conditions. I agree also with Croll and Geikie in thinking that these considerations explain the apparent anomaly of the coëxistence in the same gravels of arctic and

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ropical animals; the former having lived in the cold, while the latter flourished in the hot, periods.

It is, I think, now well established that man inhabited Europe during the milder periods of the glacial epoch. Some high authorities, indeed, consider that we have evidence of his presence in pre-glacial and even in Miocene times, but I confess that I am not satisfied on this point. Even the more recent period carries back the record of man's existence to a distance so great as altogether to change our views of ancient history.

Nor is it only as regards the antiquity and material condition of man in prehistoric times that great progress has been made. If time permitted, I should have been glad to have dwelt on the origin and development of language, of custom, and of law. On all of these the comparison of the various lower races still inhabiting as large a portion of the earth's surface, has thrown much light; while even in the most cultivated nations we find survivals, curious fancies, and lingering ideas; the fossil remains, as it were, of former customs and religions embedded in our modern civilization, like the relics of extinct animals in the crust of the earth.

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Passing the Science of Geography, Mr. Clements Markham has recently published an excellent summary of what has been accomplished during the half-century.

As regards the Arctic regions, in the year 1830 the coast line of Arctic America was only very partially known, the region between Barrow Strait and the continent, for instance, being quite unexplored, while the eastern sides of Greenland and Spitzbergen, and the coasts of Nova Zembla were almost unknown. Now the whole coast of Arctic America has been delineated, the remarkable archipelago to the north has been explored, and no less than seven northwest passages—none of them, however, of any practical value—have been traced. The northeastern passage, on the other hand, so far at least as the mouths of the great Siberian rivers, may perhaps hereafter prove of commercial importance. In the Antarctic regions, Enderby and Graham Lands were discovered in 1831–2, Balleny Islands and Sabrina Land in 1839, while the fact of the existence of the great southern continent was established in 1841 by Sir James Ross, who penetrated in 1842 to 78° 11′, the southernmost point ever reached.

In Asia, to quote from Mr. Markham, "our officers have mapped the whole of Persia and Afghanistan, surveyed Mesopotamia, and explored the Pamir steppe. Japan, Borneo, Siam, the Malay peninsula, and the greater part of China have been brought more completely to our knowledge. Eastern Turkestan has been visited, and trained native explorers have penetrated to the remotest fountains of the Oxus, and the wild plateaus of Tibet. Over the northern half of the Asiatic Continent the Russians have displayed great activity. They have traversed the wild steppes and deserts of what on old atlases was called Independent Tartary, have surveyed the courses of the Jaxartes, the Oxus and the Amur, and have navigated the Caspian and the Sea of Aral. They have pushed

their scientific investigations into the Pamir and Eastern Turkestan, until at last the British and Russian surveys have been connected."

Again, fifty years ago the vast Central Regions of Africa were almost a blank upon our best maps. The rudely drawn lakes and rivers in maps of a more ancient date had become discredited. They did not agree among themselves, the evidence upon which they were laid down could not be found, they were in many respects highly improbable, and they seemed inconsistent with what had then been ascertained concerning the Niger and the Blue and White Niles. At the date of which I speak, the Sahara had been crossed by English travelers from the shore of the Mediterranean, but the southern desert still formed a bar to travelers from the Cape, while the accounts of traders and others who alone had entered the country from the eastern and western coasts were considered to form an insufficient basis for a map.

Since that time the successful crossing of the Kalahari desert to Lake Ngami has been the prelude to an era of African discovery. Livingstone explored the basin of the Zambesi, and discovered vast lakes and waters which have proved to be those of the higher Congo. Burton and Speke opened the way from the west Coast, which Speke and Grant pursued into and down the Nile, and Stanley down the course of the middle and lower Congo; and the vast extension of Egyptian dominion has brought a huge slice of equatorial Africa within the limits of semi-civilization. The western side of Africa has been attacked at many points. Alexander and Galton were among the first to make known to us its western tropical regions immediately to the north of the Cape Colony; the Ogowé has been explored; the Congo promises to become a center of trade, and the navigable portions of the Niger, the Gambia, and the Senegal are familiarly known.

The progress of discovery in Australia has been as remarkable as that in Africa. The interior of this great continent was absolutely unknown to us fifty years ago, but is now crossed through its center by the electric telegraph, and no inconsiderable portion of it is turned into sheep-farms.

[*To be Continued*]

An eminent scientist says that all chemical actions may be regarded as actions either of contact or mixture, and are regulated in the former case by specific gravity and molecular weight—in a word, by the molecular volume of the bodies present, and in the second case by their molecular weight. In the general hypothesis of chemical action which he advances he rejects entirely the usually accepted notions of molecule and atom, and substitutes what are conveyed by the terms equivalent and atomic volume.

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PHILOSOPHY.

THOUGHTS ON THE IDEALISM OF BERKELEY.

BY E. R. KNOWLES.

We can sympathize with what must have been the feelings of Bishop Berkeley when a contemporary of his, overtaking him one day, stole up behind him and gave him a blow across the shoulders with a cane, and Berkeley, turning around, asked, "What's the matter?" "There is no matter, Berkeley, you know," was the reply. We can realize how the philosopher must have chafed under the consciousness that this man ridiculed his theory because he could not clearly understand it and appreciate its magnificence, and that in many cases his theory would always be unjustly critizised because of the impossibility of its being made perfectly clear to some minds.

For the convenience of my readers, let me briefly state here just what was Berkeley's theory of sense-perception. Berkeley carried Locke's ideas to their legitimate consequences. If the mind cannot perceive matter in any form; if the knowledge at which we can ultimately arrive is only a knowledge of a sensation or idea of the mind, what proof then, have we of the existence of matter? What proof that anything in the external world corresponds to these images of the mind? In fact, we must be quite indifferent as to whether matter really does exist or does not; for if it does, we cannot perceive it; if it does not, we are just as well off as if it did. As a legitimate conclusion from these premises, Berkeley says that it is impossible that the mind should know that the material world exists at all except that real objects, as we call them, are only combinations of ideas, existing only so far as they are perceived. "The only difference between them and the so-called imaginary ideas consists entirely in this: that the first are not dependent on our will to produce them, but are always present to our minds, whether we will or no. Imaginary ideas, on the other hand, come and go according as we will. Real ideas are also more lively and distinct, while those of the imagination are faint and confused. The knowledge of spirit is strikingly contrasted with that which we have of matter. We know ourselves and our own states or modifications directly. That the universe is permanent in its objects, viz.: ideas, and also in its laws, is to be explained by the fact that the eternal spirit constantly sustains and presents these ideas for the contemplation of created spirits. By means of these, the attributes and government of God are made known. All the things that we perceive are the ideas of God."

Berkeley was one of the clearest headed philosophers that has ever lived, and the majority of those who have opposed his philosophy have not been able

to grasp fully and appreciate the grand conceptions and hypotheses of that extraordinary intellect. This is shown by the insufficiency of many of the objections which have been made to his theory of sense-perception. Let us consider some of them. Does not the Berkelerian theory imply deception on the part of the deity? The very fact that our common sense tells us that we can only be certain of a sensation in the mind, apparently produced by a sensation of the bodily organism, and that we are able to know that our perception of an object may be a result produced by the Divine Will acting upon our minds, proves the contrary. As well charge the Deity with deception because the intuitive convictions of the ancients rendered it impossible for them to believe in the existence of the antipodes!

The Scottish school urge against the Idealists that the Ideal theory is contradictory to the intuitive convictions of the unperverted mind, and that Idealists are opponents of intuitive truth, whose actions betray that their intuitive convictions tell them differently from their theory.

The late Chauncy Wright, in one of his philosophical discussions, published in the *Nation*, once showed the weakness of the objection that the Ideal theory is contradictory to the intuitive convictions of the unperverted mind, by showing that the difficulty which even educated men among the ancients felt in conceiving the antipodes was not a difficulty of conceiving the rotundity of the earth, but a difficulty of conceiving men standing on the opposite side of the round earth, without having their feet stuck on, like flies to a ceiling; and this difficulty was such that these philosophere could not be made to credit its possibility; in other words, they had one of Dr. McCosh's intuitions on the matter."

He continues, "The antipodes were incredible to the ancients because they conceived the fact as a simple and unconditional one, and in contradiction of the the equally simple and unconditional fact of their own standing on the earth. And it is because we in modern times are able to resolve both facts into the conditions on which they depend, that they are seen not to be contradictory. So long as 'down' was conceived as an absolute direction in the universe, dependent on nothing but its own nature, so long were the antipodes incredible and stood in contradiction of as simple, original, and necessary a belief as 'that two straight lines cannot inclose a space.' In short, the ancients had in this case all the tests which the Scottish school apply as ultimate in the ascertainment of truth." The Idealist does not deny that there is an existence properly enough call the external world, and he questions not about the reality of this existence, but about the kind of reality it has. As Mr. Wright adds, "The existence of undisputed and indisputable facts is denied by no philosopher, and every true philosopher seeks for such facts; the 'idealists' and 'sensationalists' as well as the rest. But idealism was ever a stumbling block to the Scottish school, so much so that their intuitions seem to spring directly from an innate inability in the thinkers of that nation to understand this doctrine. They appear unable to

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distinguish between questions concerning the origin of an idea and a doubt of its reality."

The holder of the inferential theory and the holder of the theory of natural realism agree that the first two steps necessary to a cognition of matter are, first, an impression on the bodily organism; secondly, a sensation in the mind. The third step is, according to the inferential or "sensation" school, an inference that there must be something outside of the mind exerting its influence upon it, and corresponding to the impression, according to the Natural Realist, thought.

The Natural Realist objects to the third step taught by the "sensation school," that it is "but an old error under a new form. It tells us nothing more nor less than that the mind contemplates a sensation instead of the material object. But a sensation is one thing, and a knowledge of the external world is another thing. From the fact that there is an unextended sensation in the mind, we can never infer that there is something extended outside of the mind, which creates this sensation. Furthermore, no connection whatever can be traced between a sensation and the object creating the sensation." The Natural Realist says that his view may seem to disagree with the idea of "immediate perception," but "every sensation is joined with an immediate perception or belief in the existence of the external object!" Does the Natural Realist prove to us anything more than that the mind contemplates a sensation instead of the external object? And if, from the fact that there is an unextended sensation in the mind, we can never infer that there is something extended, outside of the mind, which creates this sensation, we are no better warranted in implicitly believing, as does the Natural Realist, in the existence of an external object and then claiming that we have an immediate perception of the external object. If no connection can be traced between a sensation and the object creating the sensation, we certainly have little reason for inferring that a material external object exists, certainly much less for believing so. The thought that leads us to believe that the sensation in the mind, of which alone we are certain, is produced by an external object exerting an influence on the mind, may not be as correct or as mature, for aught we know, as that which leads some one else to believe that *esse=percipi.*

When Dr. Witherspoon was President of Princeton College, the Berkelerian philosophy had been adopted by most of the professors and students. The doctor, however, was opposed to it, and once threw out this argument against it: "Young gentlemen, if you think there is nothing but ideas in the world, just go out on the campus and butt your heads against the college walls; you will, at least, get an idea of matter." This objection, that the intuitive convictions of the Idealist lead him to act inconsistently with his theory, does not hold good, for he maintains that the universe is permanent in its ideas, and also in its laws,—that is, the Eternal Spirit constantly sustains and presents these ideas for the contemplation of created spirits according to fixed laws. The Idealist, therefore, acts in perfect consistency with his theory. A student who would have been foolish enough to have followed Dr. Witherspoon's jocular direction would, in doing so, have acted regardless of those fixed laws, and in consequence, would have had some very

unpleasant ideas presented to his mind for contemplation by the Eternal Spirit. So also the consideration of this doctrine, that "real ideas" are presented in accordance with permanent and fixed laws, will meet the following objections: One student in the senior class at Princeton, did not believe in the Berkelerian theory of matter. On one occasion, when the students were at supper, the dish being hot mush-and-milk, this youth uttered a loud cry of pain. The tutor who presided at the long table started up in alarm, as did the other students. "Mr. Tutor," exclaimed the young man, "I beg your pardon, but I've just swallowed an exceedingly hot idea."

A minister once consoled his clerical friend, who held the Berkelerian theory, and from whom a fine horse had just been stolen, by reminding him "that he had merely lost an idea."

Many objections made to the Berkelerian philosophy are worthless, because those who make them do not take into account that the ideal theory of matter does not apply to spirit.

GEOGRAPHY.

MARTIN BEHAIM'S GLOBE.

BY E. L. BERTHOUD, GOLDEN, COL.

Without doubt the discovery of America by Christopher Columbus was an achievement whose parallel has never been known anywhere, and whose results have been extraordinary, as well as immense in their influence on civilization and advancement.

Granting all this as self-evident, yet it is a plain fact that the existence of lands in the farther limits of the western ocean was known to some, had been visited, if we may trust the few accounts and fragments that we have left, by expeditions from Iceland, Norway and Greenland, besides the Irish and Welsh adventurers who claim they went to St. Brandon, and to Vinland or New England.

The obscure accounts which Columbus picked up in his northern navigations, besides the journey to Iceland, which he made, undoubtedly convinced him that beyond the Atlantic billows he would find new lands and the wealth of the Indies.

These ideas have been suggested to us upon an examination of Martin Behaim's Globe, or map, of the world, embracing the two Hemispheres and dating about 1490–91, just previous to the discovery of America, and Sebastian Cabot's Map of the World, which he made when Chief Pilot of Spain, early in the reign of Charles the Fifth, King of Spain.

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Behaim's Map dates immediately before the discovery, and Cabot's Map thirty or forty years after, the re-discovery of the New World.

Behaim was one of the most noted cosmographers of his age; he was a native of Nuremberg, in Germany, and in person took an active part in the advancement of geographical knowledge; and we find him in the service of Portugal going with Diego Cam on a voyage of discovery along the west coast of Africa, in the latter portion of the fifteenth century. Behaim's Map owes a good deal of its reputation to its representation of an island very near the Equatorial line, which he names on his map of the Western Hemisphere, "*Insula Antilia*" *genandt* "*Septevitade*," and attaches this legend in German to it: "Nach Christe Geburth, 565, kahm S. Brandon mit seinen Schiffe, auf diese Insel der daselbst vil munders besahe und uber sieben Jahr darnach wieder in sein land zoge."*

This Island, very much in shape like the Island of Trinidad, extends about to 7° north latitude, and thence south to about 1½° north latitude, not far, indeed, from the position of Trinidad, and differing from it in longitude about 8°, which need not be considered much of an error for that period of navigation, when with most imperfect means of getting the average rate of motion of a ship under sail, with nothing but stars to guide the pilot at night, and the sun by day, the daily reckoning was but one move beyond John Phœnix's rule, viz: "To find the distance to the nearest fixed star, guess at half the distance and multiply by two." Consequently, even for several centuries after Behaim's time longitudes were calculated only by the daily count, by compass course and the "Log"; these, with rough approximate observations for latitude and without the corrections for refraction, parallax, curvature, etc. As late as the seventeenth century, nautical and astronomical tables contained directions for making astronomical quadrants for direct sight.

St. Brandon, whoever he may be, or if we accept the report that he was an Irish saint who had left the far "Jerue" on a missionary trip, was evidently one who feared not to trust himself to the fickle ocean, in the small vessels of that perion.

That he visited and saw a large island in the western ocean, we are compelled to believe, for Behaim's own notes say that "seven years after, he returned to his own country." St. Brandon was a traveler evidently. Behaim's Globe has, for nearly 400 years, been the subject of much adverse criticism, not always just and sometimes grossly misinterpreted; yet to this day its quaintness and its average quality of accuracy have been admitted, and we cannot believe him as seeking to anticipate or to deprive the great Columbus of his well earned fame.

Behaim believed that the earth was a globe, heretical even to this day, as some esteem it; witness "Brudder Jasper" in Virginia, who honestly holds up for the old doctrine that the world is a vast plain, bounded, we suppose, by the "*Nimium propinqui solis*" of old Flaccus.

* Translation—About 565 after the birth of Christ, came St. Brandon with his ship to this Island, where he saw many wonderful things and after seven years returned again to his own country.

Our venerable cosmographer, who with Diego Cam, explored the west coast to the Congo River, south of the Equator, could have easily verified, this fact witnessing nightly the diurnal rising and setting of the constellations and planets, with the new glories of the southern cross emerging from the South Polar Ocean.

Behaim's Globe dates about the year 1490. His African voyage dates 1483 and 1484, and he gave in this map the latest and most reliable delineation of the whole known world. The Cape of Good Hope is well shown with its Table mountains. The "Lunæ Montes," or Mountains of the Moon, yet shown in maps forty years ago as a veritable range of mountains in central Africa, appear on the Behaim Globe about 14° south latitude, and from them spring the river systems of south and central Africa. Lake Tschad is correctly given, while the Senegal and Gambia Rivers are shown in pretty accurate form.

Northern Europe is not very symmetrical, and Lapland is delineated as extending to the North Pole, with a group of islands west of it. Over the whole globe, Behaim indicates where some of the Apostles converted the heathen, while scattered over it are representations of towns, nations and their habitations. We find in the Eastern Hemisphere the Islands of Madagascar, Zanzibar, and Ceylon, with the Spice and Malacca Islands also, but far from their true positions, while the continent of Asia is delineated as extending south of the Tropic of Capricorn.

Cipangu (Japan) is many degree east of its true position, with a vast sea extending from that island to the North Pole.

China and Siberia are very badly shown, and north Siberia is in no manner shown as correctly as in the old Ptolemaic maps. It is laid down as extending to the North Pole also, which, with Lapland, made a circumpolar continent.

LATITUDE AND LONGITUDE OF KANSAS CITY.

BY E. A. HICKMAN, INDEPENDENCE, MO.

What is the exact position of Kansas City in latitude and longitude with reference to Washington City and the zero of North Latitude?

The rod on the tower of the Smithsonian Institution at Washington City, D. C., stands marked as being North Latitude 38° 53′ 16.64″, and West Longitude from Greenwich, England, 77° 01′ 16.18″.

Kansas City stands, as lately determined by a corps of United States scientists, on the 39th parallel of North Latitude; it passing a few hundred feet south of Independence Avenue, and at its juncture with the State Line it marks that point in the city 17° 35′ West Longitude from the point in Washington City. Thus we find that a point on the State Line seven and three-quarter miles south of the one here described in the city, is a point due west of the one first described in

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Washington City, and west of the same 17° 35′, equal in to $946\frac{386}{1000}$ miles, and north of the equator 2,701 miles.

We therefore find that the scientific departments of the United States, through their various branches and highly perfected instruments, have defined the position of every desirable point on its boundaries, both sea-coast and internal, and also the latitude and longitude of every internal position.

From these external boundaries and internal positions, lines have been traced and measured so thoroughly that the area of each State, Territory and lake has been measured and its area definitely calculated and determined. The sum of these areas, exclusive of Alaska, the Indian Territory and the great lakes, is 3,709,196 square miles; equal to 56¾ States as large as the State of Missouri, and also equal to a square with sides 1,926 miles long, and would furnish a forty-acre tract of land to each of a population of 59,347,136 people.

Its most eastern longitude (west from Greenwich) is 67° West Longitude and its most western is 124½°, and extension westwardly, 57½° of Longitude; and an extension of North Latitude from 25° to 49° or a northern extension of 24°, making in extreme north and south extension 1,648 miles, and in east and west extreme extension 2,851 miles. Within this vast area, God has given for man's gathering all the blessings he can enjoy and he is called upon to gather them by work.

Then deducting the Peninsula of Florida from the latitude—4°, Kansas City is found to be just midway between the north and south extremes, and deducting the New England States from the longitude Kansas City is in the center east and west.

EXPLORATION OF WRANGEL LAND BY RELIEF STEAMER RODGERS.

SAN FRANCISCO, November 7th.

The steam whaler Belvidere has arrived; also, the whalers Northern Light, Dawn and Rainbow. It appears the Dawn did not speak the Arctic relief steamer Rodgers as reported Saturday, but did speak the whaler Pacific, which had communicated with the Rodgers. To-day we have direct news from the Rodgers. The Belvidere spoke her September 27th, near Herald Island, steaming south for winter quarters, which she will make probably at St. Lawrence Bay. The Belvidere brought the mails of the Rodgers, from which, and from conversation between Capt. Owen, of the Belvidere, and Lieut. Berry, of the Rodgers, the following facts were learned: Lieut. Berry found Wrangel Land to be an Island. He sent a party from the Rodgers out in small boats to explore the land. They returned to the Rodgers, having gone completely around it. The party also surveyed different parts of Wrangel Land. The Rodgers did not go round, lying up while the party in boats went out. The Rodgers, after having estab-

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lished Wrangel Land to be an island, steamed one hundred and twenty odd miles north and northwest in search of further land, but failed to find any Lieutenant Berry ascended a mountain on Wrangel Island, and from the top saw sea all around it. The season had been most favorable for exploration on account of its openness, notwithstanding stormy weather. Captain Owen said that from his observations he would not be at all surprised to hear of the Jeannette coming home by way of Greenland. The Rodgers intends to send out a sledge party from the winter quarters to explore the coast of Siberia. She expects to leave winter quarters next June, and go as far north as possible.

Lieutenant Berry, in a letter to the Secretary of the Navy, dated September 27th, writes that he crossed and recrossed the 178th meridian in 73° north, and with the horizon throughout and the sky to the north clear. He did not sight the land reported by the captain of the whaling bark, as situated in 178° west longitude and extending as far north of 73° north latitude as the eye could reach, and the Lieutenant adds: "I have found the north ice of such a nature that it would not be possible to pass its outer edge, consisting in places of heavy packs, and in others of unbroken fields miles in extent. I propose to proceed from here to the coast of Siberia and follow it to the westward, looking there for tidings of the missing Jeannette, and for a suitable harbor to winter in, and from which to send out sledge parties, and be in position to succor any one who may reach that coast. Failing to find a suitable harbor, I will have a party with dogs, sledges and provisions for one year to make a search, and will winter the vessel in St. Lawrence Bay, and send parties from there also. In the spring I will proceed to Plover Bay, fill up with coal and continue the search. Since writing, the land has proven to be an island of small extent, with no other land near it. I deem it unwise to winter there as recommended by the Jeannette relief board, under the false supposition that it extended far to the northward." While exploring Wrangel Island he found a cairn formed by Captain Hooper, of the United States steamer Corwin.

The *Stock Reporter* publishes extracts from a letter from an officer of the Arctic relief steamer Rodgers, dated October 16th at St. Lawrence Bay, where the ship arrived the day before. The sledge party was landed on the Siberian coast, about fifty miles from East Cape, with one year's provisions, with orders to sledge the coast to the east and west as soon as the ground was covered with snow. The Rodgers reached latitude 73° 44′ north. No land was visible to the northward, but to the southward the flight of ducks showed that there must be land in that direction.

ARCTIC PHENOMENA.

A remarkable echo was noticed between two mountains at Plover Bay; another, noticed by our sledge party in the cliff at Cape Onmann, Siberia, gives back more than a dozen echoes; and Baron Wrangel relates that a pistol fired near the

cliffs on the river Lena is echoed a hundred times. The great distance to which small sounds are sometimes transmitted is also worthy of record. The first time this acoustic clearness of the atmosphere came under observation was at St. Michael's, where a conversation carried on at an incredible distance could be distinctly heard. Amid the grim silence and desolation of Wrangel Land, at a time, too, when the air was acoustically opaque for this latitude, I distinctly heard our boatswain, a small man, with a squeaky voice, giving orders two miles, while laughter and sounds of the voice, when any one spoke above the ordinary tone, were heard with such amazing distinctness as to suggest telephonic communication.

THE JEANNETTE'S FATE.

By the schooner Golden Fleece, which arrived on Saturday from the Arctic, the brothers Krause, who passed through here some months since, the agents of the Bremen Geographical Society, have returned. The most open season in thirty years enabled them to make observations as far north as the neighborhood of Point Barrow, beyond the usual line of the ice fields. It is their belief from what they have experienced in the latitudes which they visited that if the Jeannette is not heard from this year, say within six weeks, she will never return. There are no settlements beyond the Siberian points where she was last heard from, and here the traces of the Rodgers cease also. Although in the Arctic Ocean, north of Behring Straits, the sea is so well open, along the Siberian coast it is ice-packed. Dr. Krause, the elder, has but little hope, therefore, that the Jeannette will ever again return, although it is just barely possible in his mind that she may.—*San Francisco Chronicle.*

OFFICIAL REPORT OF THE CORWIN'S CRUISE.

Interesting details of the Corwin's cruise in the Arctic are contained in a letter received Saturday at the Treasury Department from Capt. C. L. Hooper, dated at San Francisco, October 22nd. It is in the form of a preliminary report, and recounts the recent experiences of the cutter in the Arctic Ocean and Behrings Straits. Capt. Hooper says they sailed from St. Michael's July 9th, the date of his last report, and proceeded north, touching at Golowin Bay, Sledge Island, Kings Island, Cape Prince of Wales, Cape Espenberg and the head of Kotzebell Sound. They sighted the bark Northern Light, and learned that the whaling bark Daniel Webster was in the ice-pack to the northward. They made an attempt to get up the coast in shore of the pack to learn her fate, but found that impossible.

The top of Herald Island was searched for traces of the Jeannette and missing whalers. All prominent points were carefully examined for cairns, but none

were found. They followed the edge of the pack to the westward and southward hoping to effect a landing on the south end of Wrangel Land. Finding it impossible to effect a landing until a decided change should take place in the condition of the ice, they crossed over to the Siberian coast, following the edge of the western pack. On the morning of August 5th, latitude 9° 50′ N., longitude 179° 25′ W., they picked up a lower yard about fifty feet long and twelve inches in diameter at the slings, possibly a part of the wreck boarded by the natives at Cape Wankarem. A part of the iron work still remained on the yard, quarter-blocks, sling-band, jackstay, etc. To the latter a piece of bolt-rope was attached, showing that the sail was bent when the yard was detached from the mast. The entire surface was so chafed and worn by contact with the ice that nothing remained to indicate its color, except under a piece of metal, where it had the appearance of having been painted black.

They made Cape Wankarem on the evening of the 5th, where they procured from the natives the following articles taken from the wreck, supposed to be the Vigilant: One chain bodstay, with heart attached; several pieces of chain-plate, one whole, with dead-eye strap attached; several small pieces of chain, iron bolts, pieces of iron bands, etc.; a sheath-knife bearing the initials "W. B."; a table fork, an iron spoon bearing the letter "H" on the handle, a small black leather pocketbook, containing a number of articles of cheap jewelry; a finger-ring with Masonic emblems, two coins, 1 cent and 5 cents, a portion of a truss-pad and a Rodger's pocket-knife. Many of the articles were of no value for identifying the vessel. Two whisky casks were also seen, marked Honolulu. The articles obtained were placed on exhibition for identification at the office of Wright & Browne, ship chandlers, San Francisco, who fit out many of the whalers.

On the 8th of August they steamed to the northwest, following the coast line as far as Cape North, where they again came up to the ice-pack and hauled off shore, shaping a course for Wrangel Land. Two days later they landed, after a hard battle with the ice, and raising the American flag took possession of the country in the name of the United States, giving it the name of New Columbia.

It is, he says, with some degree of diffidence that a new name is suggested for this hitherto unexplored and untouched land. It appears that Admiral Wrangel, after whom it had been called, not only never landed upon its shores, but never approached near enough to the shore to obtain a glimpse of it. Kellett, whose name has been appended to the country by the English map-makers, only dimly saw what he supposed to be an island, lying south of Herald Island. The name of New Columbia is suggested as one of national character, and not calculated to do injustice to any one, as the two prominent capes are named after those eminent Arctic navigators, Wrangel and Kellett. They had good observations during the day, and found their landing place to be in latitude 71° 40′ N., longitude 177° 40′ W. They had confidently hoped to find some tidings of the Jeannette at this point, either a cairn containing records or some sign of parties from the vessel having passed. When last seen by the whaler she was in the vicinity of Herald Island, evidently trying to get near enough to effect a landing

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there. This she did not succeed in doing, or at least she left no cairns or other marks by which her presence there could become known. They examined the shore-line with their glasses while approaching and leaving the land, north and south, and saw nothing but perpendicular cliffs of slate, from 100 to 300 feet high, the sloping banks of the river being the only place for miles where a party traveling over the ice would be able to effect a landing. Had a landing been made cairns would, of course, have been erected, and records of the cruise left. It seems equally certain that had the Jeannette landed either to the north or to the south, and remained any considerable time to explore, this place would have been visited, since it has natural advantages as a landing place over all other parts of the coast. As the first object of Capt. DeLong's voyage seemed to have been to land and explore Wrangel Land, it was to be presumed, Capt. Hooper concludes, that, had he succeeded in reaching it at all, he would have left an exploring party, even though he might not have gotten his vessel into winter quarters there. In view of these facts it is believed that the Jeannette did not reach the eastern part of Wrangel Land at all, and that if she reached any part of it she did not remain long enough to make any extended explorations. It seems equally clear that no accident befell the vessel while in the vicinity of Herald Island or Wrangel Land, both from the absence of any record of the event at those places, and from the fact that Capt. Hooper is reasonably certain from his own observations, and the reports of the natives with whom he communicated, that her people have not landed on any part of the coast of Siberia, between Cape Jakan and East Cape, or between Cape Prince of Wales and the Mackenzie River on the American side; nor had they passed along either coast in the vessel. The Corwin's party were unable to discover the slightest trace of her or her people, although during their two seasons in the Arctic they cruised a distance of about 15,000 miles and examined every accessible part of the sea thoroughly (including the ice-pack as far as it was possible to penetrate), and over 1,000 miles of coast line. Therefore, taking into consideration the position of the Jeannette when last seen, the almost absolute certainty that she did not make an extended stay at Wrangel Land or Herald Island, if she reached those places at all, and the reasonable supposition that she met with no accident, during the first winter at least, that necessitated the desertion of the vessel, it seems to Capt. Hooper strongly probable that she entered the pack northeast of Herald Island and was carried by it in a northeasterly direction. This being the case, in view of the fact that not one of the whaleships that have from time to time, in the history of this ocean, been carried north in the pack has drifted to the southward again, and knowing as they do from the testimony of every Arctic navigator how futile would be any attempt to resist the force of the pack when once fairly in motion, he may, he thinks, conclude that the Jeannette will not return by the way of Behring's Straits, but will continue to move toward the north and east; and although Capt. DeLong will undoubtedly take advantage of every lead in the endeavor to carry out his original plan of making the east coast of Greenland or Melville Sound, his movements will be controlled almost entirely by the drift of the ice. Should he, there-

fore, make the land to the east, it is by no means certain that it would be at either of the places named. In the event of the ship becoming hopelessly embayed, after drifting to the northeast after the first winter, and it became necessary to abandon her, they would doubtless make for the nearest land, which might be the continent between Cape Bathurst and Point Barrow, at Bank's Land, Melville Island, or Prince Patrick's Land. If on the continent they could communicate with the Signal Service party at Point Barrow, under the command of Lieut. Ray. If the distance were too great for them to travel, they could send word by the natives, who are constantly passing back and forth along the coast, hunting, trading or fishing. If they landed at either of the other places named, while they would be able to kill sufficient game to subsist, they would be unable to get away until a vessel was sent to their relief. The distance to the Hudson Bay trading post, or to any place occupied by white men, would be too great for men to travel equipped, as they would necessarily be if compelled to abandon their vessel and travel a great distance over the ice. If, therefore, no tidings of them are received through any of the search parties of the present year, Capt. Hooper suggests that a vessel be sent to Melville Island as early next year as the ice will permit, carrying three sledge parties, one for Bank's Land, one for the west coast of Melville Island and a third for Prince Patrick's Land. Whatever is to be done for their relief must be done promptly. If still alive, they are now entering upon their third winter of hardship in the Arctic regions; and if they have been compelled to abandon their vessel and are waiting for a vessel to be sent to their relief, unnecessary delay may, and in all probability will, prove fatal.

Capt. Hooper regretfully gives up all hope of the missing whalers Mount Wallaston and Vigilant.—*Washington* (D. C.) *Post.*

In a recent note W. T. Blanford described the distribution of land in the Indian Peninsula and the intervention of a vast plain traversed by the Indus, Ganges and Bramaputra. This plain has been generally considered to have been the basin of a great sea, but in the opinion of the author the evidence advanced does not appear to contain a single fact in favor of the sea having at any geological period occupied the Gangetic or eastern portion of the plain. The tract is evidently a depression area, filled up to above the level of the sea through a long period of time.

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ARCHÆOLOGY.

DEAD CITIES OF NEW MEXICO.

COLUMBUS MOÏSE, LAS VEGAS, N. M.

To the east of the range known as the Manzano, which lies about the centre of the Territory, and runs parallel with the Rio Grande from north to south, is a region rich with relics and full of monuments for the antiquary and historian. Here even tradition is silent, and the ruins which still exist are the only witnesses. I speak of the remnants of the old cities of Abo, Cuerrò, and Gran Quivira. When they were founded, who their inhabitants, or how long their existence, is all matter for conjecture. The remains show their size, and the nature of their people, but further than this, through lack of thorough scientific investigation, we are left to wild guess-work or to nothing. Tradition speaks of seven great cities existing in times long past somewhere within the limits of New Mexico, known as the seven cities of the Cibola, but where they were is more than debatable.

Conjecture seems, too, to have been the only move toward a solution of a question which would doubtless prove interesting as instructive. The old site of what is known as the Pecos church, an oft described and venerable ruin is thought to have been one of these cities, but I think it rather unfounded because the timbers of this church, known to be over 200 years old, are still in perfect preservation, while those of the stone churches of Abo, Cuerrò, Gran Quivira and Belen, of which I shall speak, are, with the one exception of Abo, entirely gone, the vacant niches where they once rested, alone remaining in testimony.

The ruin of the church at Abo, has one little alcove about four feet square which yet retains the roof traces—four brown and rotten logs half dropped to pieces from decay. To me it seems that in these four ruins are found four of these storied cities, and I draw my conjecture from the similarity of architecture in these church ruins, of stone, still extant, as well as from the similarity of the subterranean dwellings about them. All four of these ruins show a knowledge of architecture and an evident acquaintance with the plumb and level, for the walls and lines are as correct as these instruments could make them. First, in order of importance, both in extent and mystery, is the site of the city of El Gran Quivira which lies, as I have said, beyond the ranges of the Manzano and Oscuros and in the valley between the latter range and that of the Gallinas. The proper dimensions of the main ruin, the church, I cannot give, for I did not take any measurements, but I should judge the extreme length to be about one hundred and fifty feet with an extreme width of probably fifty feet. The walls now standing would possibly measure forty-five feet in height, and vary in thickness from

five to ten feet. They are of dressed stone laid in mud, with angles, niches and secret recesses now disclosed to view by the masks having fallen. From the appearance of the apertures once windows, I should judge them to have been in pointed arches, for the tops are broken, fallen and irregular though the sides, and the sills of stone have suffered little.

By digging anywhere in the vicinity of the church one can enter the dwellings of the ancient inhabitants, as they were under ground, and resemble cellars more than anything else. In them are found many relics in the shape of stone and copper utensils, earthenware jars and vessels, and the usual debris. The most mysterious of all connected with this old city is regarding the water supply. The remains of cultivation are seen, huge acequias can be traced about the city; the old fields are easily told. But to-day there is not one drop of water visible, nor can any source be traced from which it could have come. Sands, such as exist in river beds and lakes, shine hot and dry about the town, and what might have once been a river bed divides the dead city, proper, from the church. There is one theory which might solve it, and that is, about this point ends what the geographers mark as the "Ancient Lake Basin," in the center of which are now three extinct volcanic craters and for miles about them the mighty flow of lava. Possibly this ancient city drew its water supply from this ancient lake and it might have been that a volcanic eruption ended at once lake and city; as the houses all bear evidence of a hasty abandonment; such things being still found in them which people at leisure would naturally have removed. There are other things attractive, and teaching their lesson; for the remains of furnaces and such rude means and vessels as the primitive races used in mining may yet be found scattered about in many places, showing conclusively the existence of mines which paid, even with their rude methods. All implements found are of either stone or copper; the furnaces of mud and rock.

The other towns I have mentioned, especially Abo and Cuerrò, have the same features as Gran Quivira, except the peculiarity of the lost water supply. The mortises in the church walls show that heavy timbers were used for roofing and they must evidently have been brought from a distance and men have carried them, for at that remote time horses and oxen were unknown, nor have we any remains of wagons, or wagon roads; they were probably carried on the shoulders of men in the way Indians still do, making numerical strength answer The churches of Abo, Belen and Cuerrò, however, differ in this, from that of Gran Quivira, these ones being built of small pieces of rough stone, laid in mud, while the latter is of large squares of wrought stone. All four walls of the Cuerrò church still stand, and it is the third in size; the Belen church being smallest of all, and in most ruinous condition, only a few piles remaining erect. Only one end of the building at Abo has fallen and that caused by excavations in search of treasure, for later day traditions tell, that some of the wealthy New Mexicans thus got their nucleus. Other and later searchers have found only corpses.

The remains of this Abo ruin are most picturesque as it stands on a knoll in the center of a rough valley with mountain and forest beyond and on every side

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little hillocks indicating the hidden dwellings, while low stone houses and fences made of the very stone of the church surround it and are peopled by the men of to-day.

THE ART OF FOUNDING IN BRASS, COPPER AND BRONZE.*—CONCLUDED.

BY EDWARD TUCK.

The next great work of ancient times, of which we have any details, is the making of the various bronze and brass articles used in the building and fittings of Solomon's Temple, at Jerusalem, 1011 B. C., and this gives a really good and complete idea of the progress made in the art at that period of time.

After the formation of the Ark and its various fittings, the Hebrews were not called upon again publicly to exercise their skill in metal work. The forty years of desert wanderings rendered such quite unnecessary; and as all those that came up out of Egypt died in the wilderness, in all probability with their death passed away much, if not all, the skill and ingenuity then shown, except for weapons of war and possibly implements of agriculture. They (the Hebrews) for some centuries were so much engaged in taking possession of the land they were to inhabit in wars and fightings, that the ordinary arts of civilized life were not and could not be cultivated; notwithstanding the enormous wealth they had accumulated in the time of King David, yet when Solomon, his son, began to erect the Temple (which was a work their forefathers, when they left Egypt, could have accomplished without assistance) there were none among the people who could do the skilled work necessary in casting and working the various metals. In consequence, Solomon has to negotiate with the King of Tyre to send him men and materials to do the work. "Send me, therefore, a man cunning to work in gold, in brass, and in iron," "and that can skill to grave with the cunning men with me whom David my father did provide" (referring to some skilled workmen who the same king had sent to King David at an earlier period).

Singularly enough, the man sent by the King of Tyre as chief of the workmen, was himself of Jewish descent on his mother's side, and had come of a family of metal workers, for we read, "his father was a man of Tyre, a worker in brass." This man directed the whole of this department of the work. The vastness of the quantity of bronze or brass used we are unable to determine, for we find (1 Kings viii 47) "Solomon left all the vessels unweighed, for they were so many, neither was the weight of brass found out."

It is impossible for any one to read the graphic account given of the Temple construction in the Book of Kings, especially of the productions in metal, and not be amazed at the great variety of the work done, and the beauty and finish with

* A summary of the second prize essay of the Worshipful Company of Founders, 1880-81.

which it must have been executed, as well as the great quantities and immense castings, which would require the highest mechanical skill and knowledge.

The two bronze pillars which were fixed up in the porch of the Temple must have been splendid specimens of workmanship. Taking the cubit at the generally-recognized measurement, 21 inches, the pillars, inclusive of the capitals, will have measured over 40 feet in height and 7 feet in diameter, and the weight of the metal would be from 23 tons to 28 tons. Another question arises in connection with these pillars: if they were hollow, as Whiston in his translation of "Josephus" considers they were, it follows that the use of cores must have been known and practised at this time, although this invention is ascribed to Theodorus and Rhœcus of Samos at a much latter period; but this may be only another instance of the knowledge of certain kinds of manufacture being lost and rediscovered at some latter period.

In addition to these pillars, there was the Brazen or Bronze Altar, another gigantic work probably weighing about 200 tons; also the Molten Sea, an immense semi-circular vessel measuring seventeen and a half feet in diameter and eight and three-quarter feet deep, and containing 16,000 to 20,000 gallons of water, supported on a pedestal of twelve bronze oxen. We get no idea from the account of the size of these castings, but they must have been of sufficient size and strength to support the vessel, which, when filled with water, would weigh probably 100 tons.

In addition to these large articles, there were a large number of smaller ones, equally good in construction and workmanship; but a full description of these must be left to a further article. It is apparent that different qualities of bronze were used, for some of the articles are stated "to be of bright brass," evidently different mixtures of the alloy for the differing purposes. It is clear from the vast size of the castings that good mechanical contrivances must have been used to remove, fit up, and place them in position.

These works were cast "in the Plain of Jordan in the clay ground," or, as should be more correctly rendered, "in the depth of the clay ground between Succoth and Zarthan," showing them to have been molded in clay. Such large quantities of metal would require to be melted in a series of furnaces, in which the metal could be fused at one time, all tapped together, and the metal let run into the mold. A series of such furnaces would be constructed in a sort of a circle or square, under one large dome or roof, forming a chimney or tower.

It is most probable that such a method was adopted in those days, as we find from Nehemiah iii. 11: "Malchijah, the son of Harim, and Hashub, the son of Pahath-moab, repaired the other piece and the tower of the furnaces." This would refer to such a structure which, erected in the Plain of Jordan for the temple works, may have continued a sort of national foundry up to the time the Jews were carried captive into Babylon. And again, the restoration and consequent rebuilding of the Temple would require the same operations, and hence the repairing of the furnaces would be a necessary work.

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The knowledge of the art of working in metals thus brought into Palestine by the Tyrians at the building of the Temple seems not to have afterward declined, for we find frequent references in Scripture to works of this kind. In 740 B. C. King Ahaz, visiting King Tiglath-pileser at Damascus, saw an altar which pleased him, and sending Urijah, the priest, a drawing of it, one was made for him exactly similar. In 596 B. C. Nebuchadnezzar, King of Babylon, broke up the bronze pillars, the sea, and the bases of the Temple at Jerusalem, and removed the pieces to Babylon (a work of considerable difficulty) and it follows that probably many of the bronze articles found by Sir H. Layard and others in the ruins of that city may have been made from the bronze of the Temple furniture.

A singular confirmation of the idea that the brass and copper of Scripture are bronze is given by Mr. Edwards in the *Edinburgh Philosophical Magazine*, 1850, where he describes certain relics found near Marazion or Marghazin, one of the oldest towns in Cornwall, leading to the conclusion that the Jews had smelting houses near the shore. The remnants of these smelting pits are still called by tradition Jews' Houses, and the town itself is also called Market Jew, in addition to Marghazin, which means Market Mount; called so, no doubt by the Jews as the place where the metals were purchased and sold. Possibly the bronze alloy, the mixture of copper and tin, may have been cast here in ingots, and shipped in that form; but this is conjecture.

The bronze of classical antiquity (Greek, *Chalkôs;* Latin, *æs*) consisted of copper, with an alloy of one or more of the following metals—tin, lead, silver, zinc; the quantity and character of the alloy changing with the changing times or different times or different purposes. Amongst existing bronzes, copper varies from 67 to 05 parts. The Phœnicians who traded with the Egyptians would also bring the tin alloy to the Greeks and Romans. Homer calls the metal Kassiteros, and this is equivalent to the Arab word Kasdeer, by which tin is known in the East; it is also called Kastira in Sanscrit. We are enabled from the analysis of coins to arrive at some results as to the admixture of the metals. It thus appears from their coins that the Greeks adhered to a mixture of copper and tin till 400 B. C., after which they used lead. Silver is rare in these coins.

The Romans used lead in their coins, but gradually reduced the quantity, till, under the Emperors Caligula, Nero, Vespasian and Domitian, they coined pure copper, but afterward reverted to the mixture of lead.

This work *Chalkôs* originally appears to have been the word for pure copper, and is so employed by Homer, who calls *Eruthros* (red), *Aithops* (glittering), *Phœnnos* (shining), terms which will apply to pure copper or the bright alloys of bronze, such as the ancient mirrors were made of.

The old Greek poet describes the process of casting in almost similar terms to those in which it would be poetically described to-day, showing us that the processes then used and now were as nearly as possible alike, and proves the art of working the various substances to have been well understood at that remote period.

The passage referred to is in the "Iliad" of Homer, in the description of the manufacture of the shield of Achilles by the god Vulcan:

Thus having said, the Father of the Fires
To the black labor of his forge retires.
Soon as he bade them blow, the bellows turned
Their own mouths; and where the furnace burned
Resounding breathed; at once the blast expires,
And twenty forges catch at once the fires,
Just as the god directs; now loud, now low,
They raise a tempest or they gently blow.
In hissing flames huge silver bars are rolled,
And stubborn brass, and tin, and solid gold.

Thus the broad shield complete, the artist crowned
With his last hand, and poured the ocean round;
In living silver seemed the waves to roll;
And beat the buckler's verge and bound the whole.

In this description of the casting, Homer uses the word *Chalkós*, so that we can scarcely tell whether he means copper pure or alloyed. Further, it is more difficult when we read of the mythical Dactyles of Ida in Crete, or the Cyclops, being acquainted with the melting of *Chalkós*. It is not, however, likely, that the later Greek writers, who knew bronze in its real sense, would have used the word *Chalkós* without qualifications to describe objects which they had seen, unless they meant it to be taken as bronze.

Pausanias speaks of an old statue he had seen, made of separate pieces of metal fastened together with nails, and, using the same word, we understand him to mean bronze, as there exist very early figures of bronze thus made. We read also of the process called "sphyrelaton," being to hammer out the plates and fasten them together with nails. Pausanias also tells that "the Phœnicians pretended that Ulysses dedicated a statue of bronze to Neptune Hippius," but adds that "he does not give credit to the statement, as the art of fusing the metals and casting them in a mold was not then known." "In fact, the first who cast statues were Theodorus and Rhæcus, both natives of Samos."

It has been generally thought that their merit consisted in casting the statues with an inner core, which could be afterward removed, leaving the castings light, and therefore less costly. But this is open to question, as we have before seen from Assyrian bronzes having been found cast with an inner core of a date older than Theodorus and Rhæcus, and there is now in the British Museum an early Etruscan statuette from Sissa, on the Volturno, with a core of iron.

The Samians were very early noted for their skill in this branch of art, and before the foundation of Cyrene, B. C. 630, they made a bronze vase ornamented with griffins, supported on three colossal figures of bronze, for the Temple of Juno.

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The art was known at a very remote period in Italy. Among the Etruscans bronze statues were common before the foundation of Rome, 750 B. C., and Romulus is said to have placed a statue of himself, crowned by Victory, in a four-horse car of bronze, in the new city. Pliny states that "King Numa Pompilius, the immediate successor of Romulus, founded a fraternity of brass founders and bronze workers."

By the Romans a compound was used under the name of "oncalchum" or "auncalchum," which appears to have possessed the composition and properties of brass.

A brazen bull is traditionally said to have been contrived by Pericles at Athens for Phalaris, Tyrant of Agrigentum, 570 B. C. It had an opening in the side, to admit the victims, and a fire was kindled underneath to roast them to death. The throat was so contrived as to make the groans of the victims resemble the roaring of a bull. The artist was made the first experiment, and the tyrant for whom it was made was roasted in it, 549 B. C.

The oldest seat of bronze founding to any extent was the island of Delos, and next to that the island of Ægina. Between these two there existed a rivalry in the times of Myron and Polycletus, of whom the former used the bronze of Delos, the latter that of Ægina. More celebrated than either was the bronze of Corinth, about which it is said "that when Lucius Mummius burnt Corinth, 146 B. C., all the metals in the city melted during the conflagration, and, running together, formed the valuable composition called Corinthian brass. This is exceedingly doubtful, but there may be spice of truth in it, as long before this period the Corinthian artists had obtained great credit for their method of combining copper with gold and silver. Pliny says of it: "It consisted of gold, silver and copper, and was considered more precious than silver, and little less valuable than gold." There were three kinds of it, varying in color from white to dark yellow.

Corinthian brass appears, for the most part, to have been used for the manfacture of drinking cups and ornamental utensils. The Syriac translation of the Bible says: "Hiram made the vessels for Solomon's Temple of Corinthian brass." Pumps were invented by Ctesibus, of Alexandria, 224 B. C., and were wholly or partially of cast brass or bronze. The most distinguished colossal statue of ancient times was the Colossus of Rhodes, one of the seven wonders of the world. In the days of its prosperity the capital of the island of Rhodes was adorned with over 3,000 statues, but this one exceeded them all. It was erected at the port of Rhodes, in honor of the sun, by Chares of Lindus, a disciple of Lysippus, 290 B. C., or 288 B. C., out of the spoils which Demetrius left behind him when he raised the siege of the city.

It is asserted to have spanned the entrance to the harbor of the island, and to have admitted the passage of vessels in full sail between its wide-spread legs. Its height was about 105 feet, the time taken for its construction was twelve years, and the cost amounted to 300 talents—about £70,000.

This stupendous work was thrown down by an earthquake about 224 B. C., and for nearly nine centuries lay in ruins on the ground. Pliny says: "It was

a wonder to behold. Few persons could embrace the thumbs, and the fingers were longer than the bodies of most statues. Through the fractures were seen large cavities, into which large stones had been placed to balance it whilst standing." After the fall of the Roman Empire, when the island of Rhodes was conquered by the general-in-chief of the Caliph Othman, he sold the metal lying on the ground, weighing about 720,900 pounds, to a Jew, who loaded 980 camels in transporting it to Alexandria.

A statue of Zeus, executed at Tarentum 326 B. C. by Lysippus (the master of the maker of the Colossus of Rhodes), was forty cubits high, and though it could be moved by a touch of the hand, yet resisted the force of storms by a support at the point of greatest stress.

On the number of bronze statues in these ancient times often depended the wealth of the State, cities such as Athens and Delphos having some thousands each.

Of the vast number made by the ancient sculptors nothing but a few fragments remain; but if the colossal head of Venus in the British Museum be taken as a typical example, it will show with what thinness and fineness the figures were cast. Or, again, as an instance of the quality of Greek bronze, the figure of Siris, also in the British Museum, on which a plate of bronze will be seen beaten out till it reaches the thinness of note paper.

But if the larger works fail, there is an abundance of statuettes, candelabra, mirrors, cestæ and vessels of all kinds, Greek, Roman and Etruscan.

Works in relief (*Nóreuma*), whether beaten out, chased, or cast, are comparatively rare, though this branch of the art was practiced by the greatest sculptors. The Temple of Athene Chalkoites in Sparta had its walls covered with bronze reliefs, but this was an exception to the general rule adopted in the temple decoration.

The greater number of mirrors that exist are Etruscan; a few may be Roman and Greek. But the general rule of their being Etruscan reminds us of the reputation the Etruscans had for the production of works in bronze—not perhaps of high art, but what may be more correctly termed, "industrial art."

They were also celebrated for modeling in clay, and this, according to Pliny, "was the stage of art which immediately preceded casting in bronze, and went hand in hand with it."

The mirrors give the finest examples of patina which we find; in the alloy there seems to have been mixed a considerable quantity of silver in order to obtain a highly reflecting surface.

For articles of furniture the Romans employed Greek artists and workmen. In bronze were made the sellæ, square seats carried about at Roman entertainments; also footstools.

In the excavations made at Pompeii and Herculaneum various works in bronzes are found, showing the general adaptation made of bronze by the Romans.

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In the theater are bissellii, or chairs of state, made of bronze, and ornamented with silver, for persons of distinction and municipal authorities.

In the tepidarium of the baths are bronze benches, six feet by one foot, supported by four legs, terminating in the cloven hoofs of the cow, and ornamented at the upper end with heads of the same animal. In the same baths, a brazier of bronze, seven feet six inches by two feet six inches, supported on cast bronze legs, representing winged sphinxes, terminating in lions' paws. In one of the shops a bronze urn, evidently used for making warm decoctions, and similar to the muller now in use; a bronze mold for making pastry, and a pair of scales—articles of these kinds in addition to the large number of statues and ornamental articles.

In all the bronzes from Pompeii and Herculaneum, the blue color of the patina is very brilliant, although in other bronzes it is more generally some shade of green. This arises from their lying so long in the earth, a difference of soil probably makes a different patina; but something is also due to varieties in the alloy.

Greek seats (*thronoi*) are sculptured on the Parthenon frieze; and sumptuous Greek furniture during the last two centuries B. C. was made of bronze, damascened with gold and silver. It does not appear that the process of gilding bronze was carried to any extent in classical times, except in the production of finger rings, of which a considerable number remain.

During the excavations made in the Palace of Tiberius at Capri, the bronze cock of a reservoir was discovered. As there were conduits of water, and pipes necessarily conveying it to the baths, the knowledge of cock-making must have been known and practised, of which this discovery gives a practical proof.

By the time of the Byzantine Empire the power of modeling seems to have declined, and a taste for glittering appearance took its place, and hence the process of ornamenting bronze with reliefs was superseded by inlaying it with silver and other materials.

The art of bronze casting, which has thus sunk during the Byzantine period, was revived with great vigor in Germany in the eleventh century, and there used for the ornamentation of gates and doors of public buildings; notable instances being the bronze gates of the Cathedral of Hildesheim, A. D. 1015, and the column decorated with reliefs on the model of the Trajan Column at Rome, A. D. 1922.

In the twelfth century the art spread southward to Italy, and was at first taken up energetically in lower Italy. But though many interesting works of this date exist—and also from the thirteenth and fourteenth centuries—it was not until the fifteenth century that the art obtained its full mastery. Then the revival of classical art became a real revival under the Florentine artists. Andrea Pisano had made a bronze gate in the Gothic style for the Baptistry of St. John at Florence, 1330 A. D., and in 1401 A. D., the Florentine Council decided to erect another. A competition of artists for the work resulted in the selection of Lorenzo Ghiberti. The contract was entered into with him and his father, Novem-

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ber 23, 1403, A. D., and the gates completed and fixed April 24, 1424 A. D. They are truly a magnificent piece of art workmanship, remarkable in several respects as specimens of figure and ornamental modeling of the greatest possible excellence, and which have formed the models in this style for artists of all the following years, and of metal casting which cannot be surpassed.

The subjects of the twenty-eight panels of the gates are from the life of Christ.

On January 2, 1424, A. D., Ghiberti received the commission for the second pair of gates for the same building, and these, containing subjects from the Old Testament, were completed and fixed June 16, 1452 A. D. The Martinengo Tomb, in Brescia, erected about the year 1530 A. D. to Marcantonio Martinengo, though by what artist is unknown, is a fine specimen of this period. The bas-reliefs of bronze are subjects from profane history, and a triumphant procession in bronze adorns the principal frieze.

This development of taste extended to Naples, Rome, Milan, and Venice. Even Raphael designed ornaments for the molders, of purest taste and most exquisite fancy.

In the sixteenth century it is found carried on with extraordinary skill in Germany at Nuremberg, Augsburg, Munich, and Coburg.

In France also we find the art gaining importance, as may be seen from the bas reliefs in the Chateau d'Anet, the residence of Diana of Poictiers, which was restored under Philibert de Lorme, 1547–8 A. D., and the monument erected to the memory of Charles VIII, 1499 A. D., around which were figures of the Virtues, executed in gilt bronze. Since then the art of sculpture in bronze may be said to have reverted to nearly its original limits, namely, the production of statues and groups in the round.

In 1699 a bronze equestrian statue of Louis XIV. was erected in the Place Vendome, Paris. This was of gigantic size, containing 60,000 pounds of bronze. It was demolished during one of the revolutions, 1792 A. D.

The wood furniture during the Renaissance period was decorated and inlaid with brass and bronze. In the eighteenth century we find Ciseleurs mentioned as makers of such brass edgings for furniture.

Perhaps the grandest bronze work of modern times is the colossal statue of Bavaria, completed and inaugurated at Munich, October 3, 1850. This statue was, at the suggestion of King Ludwig, designed by Schwanthaler, the sculptor, and his friend, Lazarini, who modeled the figure under his direction. For the casting it was necessary to melt twenty tons of bronze, a most perilous labor. To give some tangible idea of the size of the figure: In the head or upper part of the bust twenty-five men have found room, in the central part of the figure thirty-five to forty persons could dine, and the space of ground covered by the lower section is enormous in proportion. The figure of this colossal maiden, with the lion by her side, is fifty-four feet in height—nearly twice the height of the equestrian statue of Wellington, opposite Hyde Park corner—*Van Nostrand's Engineering Magazine.*

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WERE ANCIENT COPPER IMPLEMENTS HAMMERED OR MOLDED INTO SHAPE?

BY PROFESSOR F. W. PUTNAM.

I notice in the last number of the REVIEW, page 406, that Prof. Reid states that a fragment of a copper axe which he found on the surface in Missouri, but which he calls "a Mound-builder's axe," was cast in a mold. Now, may I take the liberty of asking why he thought the axe was cast, and not hammered into shape? Several authors have made just such statements without giving their reasons, and to those who think that all the copper implements and ornaments found in the United States were hammered into shape and not cast in molds, such off-hand statements are very unsatisfactory, and in the present state of archæological science they ought not to be made without supporting evidence. If any one has a copper implement which he thinks was cast in a mold, do let us have his reasons.

On the same page Prof. Reid quotes Mr. Conant's statement that "Copper implements cast in molds, and the *molds* themselves have been found in Wisconsin." Now, can any one give an account of the "molds found in Wisconsin." What were they made of, and where are they now?

The difficulty of melting pure copper is considerable, and as we have pretty good evidence that at least a large proportion of the objects made of copper were hammered into shape, every statement of the melting and casting of copper by any people in North America, outside of Mexico, before European contact, must be taken with due caution. Even the statement by Champlain, that an Algonquin Indian gave him a piece of copper a foot long which had been melted into sheets and smoothed with stones, I question as the correct interpretation of the Indian's words. The "lumps of copper" could have been more easily pounded into sheets than melted by an Indian wandering into the copper region of Lake Superior, and the statement that it was smoothed with stones after melting, seems to me very likely to indicate the assumption, on the part of Champlain, of the melting part. That copper was used in large quantities by the Indians there is no doubt, and it was also used to a considerable degree by the tribes who erected the burial mounds in the Ohio valley and throughout the southwest, whoever they were, but I have not yet seen a single object made of copper from these sources that I should regard as having been cast; on the contrary, the evidence of hammering, and rolling between stones, is more or less clearly shown in all by the character of the surface and by the distinct lamination of the metal in places, when carefully examined with a lens.

Trusting that these remarks will call attention to a point on which contributors to the REVIEW, and other writers, should in future be more critical,

I remain yours very truly,

F. W. PUTNAM.

CAMBRIDGE, MASS., November 17, 1881.

NOTE.—We have also received a letter from a member of the Wisconsin Academy of Sciences living at Racine, informing us that Mr. Conant has, sometime since, admitted that he was mistaken in making the statement quoted by Prof. Reid relating to the finding of molds for copper implements in Wisconsin. —[EDITOR REVIEW.

GEOLOGY.

PLIOCENE FORMATION OF SOUTHERN OREGON.*—CONTINUED.

BY CHARLES H. STERNBERG.

I give below a list of the species discovered by myself during the fall of 1877. The specimens are in the possession of Prof. E. D. Cope, of Philadelphia, by whom they are described in the Bulletins of the U. S. Survey.

BIRDS.—Graculus macropus, sp. nov.
Cygnus paloregonus, sp. nov.
Podiceps occidentalis.
P. near culiformeus.
Podilymbus podiceps.
Anser Canadensis.
A. albifrons.
Fulica Americana.

MAMMALS.—Auchenia vitakeriana, sp. nov.
A. magna.
A. hesterna.
Equus major.
E. occidentalis.
Elephas primigenius.
Canis latrans.
Lutra, near pescinaira.
Castor fiber.
Thomonys talpoides.
T. clusius.
Mylodon sodalis, sp. nov.

* See REVIEW of February, 1881.

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PROFESSOR SCHAEFFER ON THE BURLINGTON GRAVEL.

Since the publication of the article on the "Burlington Gravel Beds" in the October number of the REVIEW, the author has received the following note from Prof. C. A. Schaeffer, of Cornell University, New York, to whom was sent a package of chert for examination. Prof. Schaeffer has the chair of General Chemistry and Mineralogy, in Cornell University, and has a wide reputation as a chemist. He writes from Ithica under date of September 21, 1881, and says:

"Your letter of the 12th ult. was received during my absence from home, but until to-day I have had no time to examine the specimens. The pebbles consist of quartz, more or less regularly permeated by oxide of iron, and in some cases containing grains of sand. The distribution of the iron oxide is such in several cases as to characterize the specimens as jasper—namely, those having a waxy lustre. A closer examination shows in several cases a large number of small silicified corals, the two genera *Fenestella* and *Trematopora* being readily distinguishable. The species could only be determined by a more careful study than I can at present devote to the matter. For the same reason I cannot exactly decide the geological position in which these pebbles were found, somewhere in the Silurian, however. From a theoretical standpoint there is no doubt that the gravel will answer well as a *macadamizing* material, since the pebbles consist almost entirely of quartz."

This confirms the opinion of Dr. Eaton who, on a casual examination, thought the pebbles were jasper, as they possessed all the apparent characteristics, but reserved his opinion until he had made a chemical examination. While examining Shell Island, Prof. Parker found a fine bivalve fossil embedded in one of the pieces of gravel. The fossil was placed in the package of gravel sent for examination to Prof. J. D. Dana, of Yale College.

ZOOLOGY.

MUSEUM OF COMPARATIVE ZOÖLOGY, AT HARVARD COLLEGE.

BY CHARLES H. STERNBERG.

This Museum, founded by the lamented Louis Agassiz, teacher, and so ably carried on by his successor, Alexander Agassiz, who has built a large addition 80x120 feet and in other ways done much to carry out the wishes of his father, is situated near Harvard College, Cambridge, eight miles from Boston. The building is of brick, five stories high. It is 360 feet long and 80 feet wide, except the addition, which is 120 feet wide. The basement occupies the whole

under part of the building and is used for storing alcoholic specimens of Radiates, Fishes, Birds and Mammals, with rooms for aquarium and work shops.

FIRST FLOOR.—Palæontological exhibition rooms, with representative fossils from the Cambrian, Devonian, Silurian, Carboniferous, Triassic, Jurassic, Cretaceous and Tertiary formations. Also a zoölogical synoptic room, laboratories for college students, geological and palæontological work-rooms and professors, rooms.

SECOND FLOOR.—Work-rooms in physiology and anatomy; synoptic room in palæontological formations; geological and palæontological room for special students, library, curator's room, etc.

THIRD FLOOR.—Zoölogical exhibition rooms. Systematic collections of mollusca, polyps, fishes, birds and mammals. Also rooms for North American, South American, African, Indo-Asiatic, European and Siberian, Atlantic, Pacific and Southern Ocean Faunas.

FOURTH FLOOR.—Systematic collections of mollusca, polyps, erchinoderms, acalephs, sponges, crustacea, worms, batrachians and reptiles in four rooms. With rooms for North American, Madagascar, Australian and Indian Faunas. Laboratories for college students, and for special students in zoölogy.

FIFTH FLOOR.—Work-rooms for entomology, conchology, radiates, birds, mammals and skeletons, and large lecture room.

I think the plan to give a synoptic room, where orders and families can be studied, and that of arranging rooms in reference to the geographical distribution of animals, is not only original, but the best one possible. Associated with typical species of recent animals are their extinct ancestors in many cases, and it is greatly to be hoped that a large series of ancestral types will be exhibited here in the near future. The study of palæontology would then, as it should, go side by side with comparative anatomy. Skeletons of recent animals are usually mounted by the side of the stuffed ones.

The synoptic room includes typical specimens of the mammals, birds, reptiles, amphibians, radiates, class erchinoderms, articulates, classes cretaceans and insects, cephalopodes, mollusks, gastropods and lamellibranchiata.

In the zoölogical exhibition rooms, of the order Primates, man, orang, gorilla, lemurs, etc.

Order Carnivora—Several species.

Order Ungulata—American bison, skulls of Brazilian ox and Indian buffalo, cast of limbs and skull of the extinct Livatherium, skulls of Bos Primigenius, Rocky Mountain Goat and Sheep, Prong-horn, Saiga Antelope, Chamois, American Elk, Moose, Red Deer, Sambos Deer, Giraffe, Dromedary, Alpaca, Axis Deer, Zebra, skulls of Hippopotamus, Rhinoceros, Elephant and Mastodon.

Sub-order Primipeda—Northern Fur Seal, common Seal.

Order Cete—Pilot Whale, Dolphin, Manatee.

Order Brata—Giant Ant-Eater, three-toed Sloth.

Order Marsupialia—Tasmania Wolf, great Kangaroo, Ashy Coali, Vulpine Phalangu, etc.

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South American Fauna—Ant-Eaters, Alpacas, Guanaco Llama, cast of the gigantic Sloth, Megatherium, Birds, etc.

North American Fauna—Birds, a large collection of all the classes found here; Mammals, Northern Hare, Wood Hare, Porcupine, Beaver, Yellow-bellied Marmot, Rocky Mountain Striped Squirrel, Grey, Red and Western Fox Squirrels, Woodchucks, Rocky Mountain Sheep and Goat, Virginia Deer, Mule Deer, American Elk, Woodland Caribou, Mexican Deer, American Bison, Mounted skeleton of Mastodon Panther, Canada Lynx, Bay Lynx, American Wild Cat, Grey Wolf, Arctic Grey, Red Kit and Prairie Foxes, Coyote, Black, Polar and Grizzly Bears, Fisher, Wolverine, American Sable, Weasel, Woold Ermine, Mink, Mexican Otter, Skunk, American Badger, Mexican Badger, American Otter, Raccoon, Civet Cat, Harbor Seal, Harp Seal, Sea Lion, etc.

One room contains representatives of Polyps in glass, colored like the original, they are very beautiful, with hues that rival our most brilliant flowers.

Taking this museum as a whole, I think it is one of the best places in America for students in natural science. The large rooms in the Agassiz addition are not yet finished. Thousands of specimens are ready to be placed in them. Time would fail me to tell of the countless boxes, barrels, trays, jars, etc., that are filled with valuable specimens from all the domains of science, stored away for future exhibition, study or exchange.

I have only been a short time in the museum and my time has been occupied in unpacking, mending, and cleaning the collections I have made during the present season, among the rich fossiliferous beds of Kansas, so I have had little time to examine the museum collections. This I trust will excuse the imperfect manner in which I have written, but I hope I have said enough to give the reader a slight insight into the wonders from all parts of the world gathered here.

The public are admitted into the exhibition rooms from 9 A. M. to 5 P. M., and on Sundays from 1 to 5 P. M.

SOME LARGE MEMBERS OF THE WASP FAMILY.

BY REV. L. J. TEMPLIN.

While spending the last summer in Colorado I was permitted to see some of our largest wasps, that I had never seen before, and observed some of their habits that were of interest to me. I allude to the gigantic Digger Wasp (*Stizus grandis*, Say), and the Tarantula killer (*Pepsis formosa*, Say).

The former of these I observed in the act of capturing and carrying off a large specimen of Harvest Fly, (*Cicada canicularis*,) with which this species is accustomed to provision its nests. Their habit is to sting their prey just enough to paralyze but not to kill it. In this condition it is placed in a hole previously prepared, in which a single egg is laid and the hole is then carefully filled and smoothed over with such nicety as generally to elude the sharpest scrutiny of

rival females of the same species. For I am compelled, in order to tell the whole truth, that honesty is not a cardinal virtue of the Wasp family. If one of those females, in search of provisions for her future progeny, should discover a nest already provisioned, she would eagerly seize such stores as her own lawful prize. Hence they use great caution not to leave a trace of their work to mark the spot where their treasures lie buried.

While stopping in Pueblo, Colorado, during last August, I was one day standing under a tree just across the railroad from the Santa Fè Company's roundhouse, and a few rods west of the gas works, then in process of erection, when I suddenly heard, just over my head, a lively fluttering and drumming of a large *Cicada*. A moment later it fell to the ground only a few feet from the spot where I stood. On closer observation I discovered that it was in the clutches of a *Stizus*, and though employing its comparatively enormous strength, it was unable to shake off its enemy. No sooner had the wasp secured a firm hold on its prey with its second and third pairs of feet than it began to ascend the tree, partly by flying and partly by climbing with its first pair of feet. When it had ascended to the height of about ten feet it stopped and pierced its victim with its sting. In a minute or so the Cicada ceased all its struggles and became perfectly quiet. The Wasp now took a firm hold on it and started for its nest. Though its load must have weighed twice as much as itself the Wasp made a steady though slow flight, gradually rising till it passed over the roundhouse and disappeared from my sight.

A few weeks after the above occurence, while stopping at La Junta, Colorado, I was told that the Texas Tarantula was quite common in that vicinity. Several were caught while I was there, and I identified them as the real *Mygale Hentzii*. One man stated as a strange fact that he had seen a large Wasp pursue one of these large spiders into its hole and drag it out and carry it off. From his description I was satisfied that it was the *Pepsis* (*Pompilus*) *formosa*, Say, or Tarantula killer. Not one of thirty or forty men at work there seemed to be aware that the Tarantula had such an enemy. A day or two after that, while with some men at work removing some timbers, a Tarantula was killed. A few moments afterward a large wasp was seen flying around. I called attention to the fact that it was probably attracted by the odor of the Tarantula just killed. All watched with eager interest till, after circling around several times, it settled upon the the dead body of the Tarantula. After a very close scrutiny of that animal the Wasp left it and after soaring a few times around the spot it flew away. It seemed that its instinct taught it that an animal killed as that one had been would be subject to putrefaction and decay if placed in the nest with an egg, and thus bring death instead of life to its off-spring. This was a true Tarantula Killer that provisions its nest with this gigantic spider. It is said that this Wasp will pursue its prey with the precision and perseverance of a trail-hound; it will fly along a few inches from the surface of the ground, following up the trail along which the Tarantula has passed an hour or more before. When it sights its prey it begins to fly in circles around it, drawing nearer at each revolution till it makes

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the fatal dart to seize its victim. As soon as the Arachnid finds itself discovered it stops, trembles and prepares for defence by rearing on its hind feet. The contest is short but sharp and ends in the spider's receiving a paralyzing thrust from the sting of its mortal foe, and it is soon put away, not exactly as canned meat, but as preserved food for use in a future time of need.

HUTCHINSON, KANASS, Nov. 12, 1881.

ASTRONOMY.

ASTRONOMICAL NOTES FOR DECEMBER, 1881.

BY W. W. ALEXANDER, KANSAS CITY, MO.

THE SUN.

Date.	Right Ascension.	Declination S.	Equation of Time.
1st.	16h. 32m.	21° 55′	10m. 34s. —
5th.	16 59	22 27	8 57 —
10th.	17 11	22 59	6 45 —
15th.	17 33	23 18	4 23 —
20th.	17 56	23 26	1 54 —
25th.	18 18	23 21	0 35 +
31st.	18 45	23 03	3 31 +

THE MOON.

Date.	Right Ascension.	Declination.	Apparent Semi-diameter.
1st.	1h. 26m.	13° 05′ N.	15′ 50″
5th.	5 05	22 05	15 15
10th.	9 16	10 40	14 47
15th.	13 02	11 03 S.	15 16
20th.	17 44	21 49	16 27
25th.	22 38	3 00	16 17
31st.	3 55	21 04 N.	15 20

The most favorable time for making telescopic observations will be from the 11th to the 15th and from 25th to the 29th.

MERCURY.

Date.	Right Ascension.	Declination S.	M. T. of Meridian Passage.
1st.	15h. 17m.	16° 21′	10h. 35m. A. M.
5th.	15 39	18 10	10 37
10th.	16 10	20 18	10 53
15th.	16 41	22 06	11 05

20th.	17	14	23 30	11 18
25th.	17	48	24 25	11 33
31st.	18	29	24 47	11 51

Apparent diameter on the 1st 5.6″, on the 31st 4.6″. On the 4th 3h. A. M. it is 1° 23′ east of Venus.

VENUS.

Date.	Right Ascension.	Declination S.	M. T. of Meridian Passage.
1st.	15h. 13m.	16° 38′	10h. 30m. A. M.
5th.	15 32	18 00	10 35
10th.	15 58	19 13	10 41
15th.	16 24	20 52	10 47
20th.	16 51	21 56	10 54
25th.	17 24	22 52	11 03
30th.	17 50	23 20	11 11

Apparent diameter on the 15th 10.4″, being about 1/6 of the apparent size when nearest to the earth. The disk will be nearly round.

MARS.

Date.	Right Ascension.	Declination N.	M. T. of Meridian Passage.
1st.	7h. 03m.	25° 14′	2h. 17m. A. M.
5th.	6 58	25 31	1 57
10th.	6 53	25 53	1 31
15th.	6 45	26 14	1 04
20th.	6 36	26 33	0 36
25th.	6 28	26 49	0 07
31st.	6 18	27 02	11 33 P. M.

On the 26th it will be in opposition or 180° from the Sun, and in the best position for observation. Apparent diameter on the 27th, 16.6″

JUPITER.

Date.	Right Ascension.	Declination N.	M. T. of Meridian Passage.
1st.	3h. 06m.	16° 18′	10h. 21m. P. M.
5th.	3 05	16 11	10 04
10th.	3 03	16 03	9 42
15th.	3 01	15 57	9 21
20th.	2 59	15 52	9 00
25th.	2 58	15 48	8 39
31st.	2 57	15 45	8 14

Apparent diameter on the 15th, 44.9″, and is slowly decreasing during the entire month.

JUPITER'S SATELLITES.

Abbreviations used—In. denotes ingress; Eg., egress; Dis., disappearance; Ec., eclipse; Oc., occultation; Tr., transit of the satellite; Sh., transit of the shadow.

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DATE.		PHENOMENA.
2d,	6:57 p. m.	Ganymede, Tr. In.
	8:28 p. m.	Ganymede, Tr. Eg.
	8:51 p. m.	Ganymede, Sh. In.
	10:41 p. m.	Ganymede, Sh. Eg.
4th,	9:02 p. m.	Europa, Sh. In.
	10:32 p. m.	Europa, Tr. Eg.
6th,	6:26 p. m.	Europa, Ec. Re.
	6:42 p. m.	Io, Sh. In.
	8:18 p. m.	Io, Tr. Eg.
	8:54 p. m.	Io, Sh. Eg.
7th,	6:03 p. m.	Io, Ec. Re.
9th,	10:16 p. m.	Ganymede, Tr. In.
11th,	10:16 p. m.	Europa, Tr. In.
12th,	10:36 p. m.	Io, Oc. Dis.
13th,	7:51 p. m.	Io, Tr. In.
	8:36 p. m.	Io, Sh. In.
	9:01 p. m.	Europa, Ec. Re.
	10:03 p. m.	Io, Tr. Eg.
	10:48 p. m.	Io, Sh. Eg.
14th,	7:59 p. m.	Io, Ec. Re.
20th,	6:52 p. m.	Ganymede, Ec. Dis.
	7:27 p. m.	Europa, Oc. Dis.
	8:26 p. m.	Ganymede, Ec. Re.
	9:38 p. m.	Io, Tr. In.
	10:31 p. m.	Io, Sh. In.
	11:37 p. m.	Europa, Ec. Re.
	11:49 p. m.	Io, Tr. Eg.
21st,	6:50 p. m.	Io, Oc. Dis.
22d,	6:15 p. m.	Europa, Sh. Eg.
	6:16 p. m.	Io, Tr. Eg.
27th,	6:39 p. m.	Ganymede, Oc. Dis.
	8:27 p. m.	Ganymede, Oc. Re.
	9:38 p. m.	Europa, Oc. Dis.
29th,	8:04 p. m.	Io, Tr. Eg.
	8:54 p. m.	Europa, Sh. Eg.
	9:07 p. m.	Io, Sh. Eg.
30th,	6:19 p. m.	Io, Ec. Re.

K. C. M. S. T. to be used in observatory.

SATURN.

Date.	Right Ascension.	Declination N.	M. T. of Meridian Passage.
1st.	2h. 20m.	11° 18′	9h. 36m. P. M.
5th.	2 20	11 14	9 20
10th.	2 19	11 10	8 59
15th.	2 18	11 07	8 38
20th.	2 17	11 04	8 18
25th.	2 16	11 03	7 58
31st.	2 16	11 03	7 34

Apparent diameter on the 15th, 18.2″. Elements of the ring, outer Major Axis 43.3″; Minor 13.4″; inclination of northern Semi-Minor Axis to circle of declination from North to East 16.8′; the elevation of the earth above the plane of the ring 18° 5′; the sun 19° 54′; earth's longitude from Saturn counted on plane of ring from the ring's ascending node on equator 87° 45′, on ecliptic 45°.

URANUS.

Date.	Right Ascension.	Declination N.	M. T. of Meridian Passage.
1st.	11h. 18m.	5° 19′	6h. 32m. A. M.
10th.	11 19	5 16	5 57
20th.	11 19	5 14	5 18
31st.	11 19	5 15	4 55

NEPTUNE.

Date.	Right Ascension.	Declination N.	M. T. of Meridian Passage.
1st.	2h. 50m.	14° 27′	10h. 05m. P. M.
31st.	2 48	14 18	8 05

PHENOMENA.

On the 2d at 6h. P. M., conjunction of Saturn and the Moon. Saturn south 5° 36′.

On the 3rd at 7h. A. M., conjunction of Neptune and the Moon. Neptune south 4° 07′.

On the 3rd at 1h. 46m. P. M., conjunction of Jupiter and the Moon. Jupiter south 3° 04′.

On the 4th at 2h. A. M., conjunction of Mercury and Venus. Mercury east 1° 23′.

On the 7th at 7h. 32m. P. M., conjunction of Mars and the Moon. Mars north 5° 51′.

On the 8th at 4h. P. M., conjunction of Mercury and B'Scorpii. Mercury south 0° 05′.

On the 10th at 0h. P. M., conjunction of Venus and B'Scorpii. Venus south 0° 05′.

On the 19th at 7h. 47m. P. M., conjunction of Venus and the Moon. Venus north 0° 12′.

On the 20th at 5h. 16m. A. M., conjunction of Mercury and the Moon. Mercury south 1° 22′.

On the 26th at 11h. P. M., opposition Mars and the Sun.

On the 29th at 9h. 44m. P. M., conjunction of Saturn and the Moon. Saturn south 5° 32′.

On the 30th at 0h. P. M., conjunction of Neptune and the Moon. Neptune south 4° 6′.

On the 30th at 4h. P. M., conjunction of Jupiter and the Moon. Jupiter south 3° 6′

SOLAR THEORIES.

BY PROFESSOR H. S. S. SMITH, KANSAS UNIVERSITY.

Prof. Young's recent work* on the Sun has given prominence to some changes in the theory of the solar constitution, and it may be allowable to state what we know and what we do not know of this difficult problem.

Any sufficient theory of the constitution of the Sun must be one combining many considerations, astronomical, physical, and chemical. It is a problem difficult on account of its complexity, so many known and unknown quantities

* The Sun; by Prof. C. A Young. Appleton, 1881.

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entering that their due arrangement and subordination becomes a task well nigh impossible. Difficult also from the magnitude of the operations involved, pressures so great and temperatures so high that our terrestrial experiments are but gropings in the dark. We have to measure the sun by a candle.

The first point to be stated is that by far the greater part of the Sun is probably in a gaseous condition. That in the photosphere some substances are so far cooled as to become liquid and, may be, solid, there seems to be little doubt; but the central body, the chromosphere, part of the photosphere, and part of the corona are considered to be gaseous. It is generally believed that the gases composing the central part cannot act as do gases on earth; the density of the sun, the pressure consequent upon its great mass, and the temperature necessary to keep up the observed radiation, all producing results that modify the general properties of the gases. They "would be denser than water, and, since, as Maxwell and others have shown, the viscosity of a gas increases fast with rising temperature, it is probable that it would resist motion something like a mass of pitch or putty."† That the chromosphere and its prominences and some parts of the corona are in a gaseous condition, the spectroscope abundantly proves.

The supposition of the gaseous condition of the Sun enables us to explain some known facts. It is within reason to suppose that the pressure and temperature can be so combined as to produce the known density of the Sun. In fact, if we but knew that there is but one element in the Sun, and what that element is, we could calculate the temperature from the known density and pressure.

The source of the energy radiated by the Sun and the manner of its radiation are readily explained on this gaseous hypothesis. The light and heat may come from one or both of two sources, (1). gases and vapors so condensed as to give continuous spectra, (2) matter that has cooled below its boiling point and has consequently become liquid or solid. It will be seen that the latter is the more probable condition of affairs. The supply of energy is explained according to the well known fact of the heating of a gaseous sphere by the contraction caused by cooling. It is estimated that a reduction of the solar diameter 220 feet per annum would produce the present radiant energy. It is quite probable, however, that this contraction is not the only source of the Sun's heat, for the impact of meteors cannot fail to set free an immense amount of energy.

Again by admitting that the sun is gaseous rather than solid—the latter supposition was made by Herschel and is held by Zöllner and hinted at by Spoerer—the unequal times of rotation at different latitudes can be considered as possible; so far as I know, however, no adequate explanation of this phenomenon has yet been advanced.

To explain the phenomena seen at and near the visible surface of the sun it becomes necessary to localize certain actions that are supposed to take place in that region. Briefly it is supposed that the region which we call the photosphere is so cool in comparison with the central parts that its temperature is below the

† The Sun; page 286.

boiling point of some substance (probably of the carbon group) and that this substance is in a liquid or solid state, being cooled as masses of vapor rise from the interior. This cooling comes from both radiation and expansion. When sufficiently cool to appear dark in comparison with the hotter droplets, it forms a a cloudlike layer of smoke. It must be borne in mind that the bright droplets and darker smoke particles are floating in an atmosphere of the vapors of other metals; for the temperature is above the boiling point of all elements but the one supposed. The supply of liquid droplets is easily accounted for by supposing that the smoke particles are continually raining down through the region of cooling and, after being heated in the interior, are again forced upward, again liquified, and again become smoke. White light is given out by the drops of molten matter and, during its course through the incandescent vapors in which these drops float, is robbed of certain rays chosen by those vapors; while in passing through the smoky layer general absorption takes place. This conception, first fully elaborated by Prof. Hastings,* explains satisfactorily many known facts. The mottled appearance of the Sun's surface, the general absorption with its prominent increase near the limbs, the selective absorption and its very feeble modification at the limbs, faculæ, sun spots, and some puzzling questions of solar spectroscopy, all yield readily to its influence. As an explanation of photospheric phenomena the theory seems to be quite satisfactory, but its province is limited.

The condition of affairs in the chromosphere, the formation and nature of the prominences, the velocities with which the matter that composes them is forced upward, the nature and condition of the atmosphere in which they are, their density and temperature, these are questions that have, as yet, no satisfactory answers.

And what of the corona? It has been conjectured that it consists of matter ejected from the Sun and kept in suspense by electrical repulsion; that there is a constant supply of this ejected matter; that there is an exceedingly attenuated atmosphere of gas surrounding the Sun and through it clouds of meteors follow their orbits obedient to the law of gravitation. The truth is that the only facts that we know are that it is partly gaseous and partly solid (or liquid) and that its density is very small indeed. Beyond these, conjecture has supreme control.

We may say, then, that in all probability the Sun, as a whole, is gaseous; that the photosphere is a region of liquefaction and solidification; that we know but little about the prominences; still less about the corona; and that our ignorance of solar dynamics is almost perfect.

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* American Journal of Science and Arts. Third Series, Vol. XXI, page 33.

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METEOROLOGY.

REPORT FROM OBSERVATIONS TAKEN AT CENTRAL STATION, WASHBURN COLLEGE, TOPEKA, KANSAS.

BY PROF. J. T. LOVEWELL, DIRECTOR.

Highest barometer during month, 29.40 on the 19th. Lowest barometer during month, 28.38 on the 17th.

Highest temperature during month, 72° on the 5th. Lowest temperature during month, 07° on the 19th.

Highest velocity of wind during month 39 on the 17th. Snow on the 18th.

The usual summary by decades is given below.

TEMPERATURE OF THE AIR.	Oct. 20th to 30th.	Nov. 1st to 10th.	Nov. 10th to 20th.	Mean.
MIN. AND MAX. AVERAGES.				
Min	42.8	34.5	21.5	32.9
Max	63.0	59.3	47.8	56.7
Min. and Max	53.6	46.8	34.0	44.8
Range	21.1	24.8	24.2	23.4
TRI-DAILY OBSERVATIONS.				
7 a. m.	49.0	40.7	33.6	41.1
2 p. m.	62.4	55.1	37.8	58.6
9 p. m.	52.0	41.8	33.3	42.4
Mean	54.2	45.8	34.8	44.9
RELATIVE HUMIDITY.				
7. a. m.	.88	.80	.82	.83
2 p. m.	.71	.57	.69	.66
9 p. m.	.75	.79	.70	.75
Mean	.81	.73	.74	.76
PRESSURE AS OBSERVED.				
7 a. m.	28.84	28.94	29 03	28.96
2 p. m.	28.80	28.90	28.94	28.88
9 p. m.	28.81	28.96	29.05	28.97
Mean	28 82	28.93	28.97	28.91
MILES PER HOUR OF WIND.				
7 a. m.	14.1	14 9	17.2	15.4
2 p. m.	20.4	24.1	23.6	22.7
9 p. m.	14.0	16.6	17.3	16.0
Total miles	3864	3984	4767	12613
CLOUDING BY TENTHS.				
7 a. m.	4.8	5.2	5.4	5.5
2 p. m.	6.4	6.1	5.1	5.9
9 p. m.	3.2	4.9	3.6	3.9
RAIN.				
Inches	.46	1.70	.00	2.16

ON AN ELECTRIC SELF-REGISTER FOR THE ANEMOSCOPE AND ANEMOMETER.*

BY PROF. H. E. SADLER, OF THE KANSAS STATE NORMAL SCHOOL.

The current from a Robinson's Anemometer is carried to four springs, electrically connected about the dial of the anemoscope, each of which presents a projection at one of the cardinal points. The arrow carries a section of a cylinder, concentric with its axis and three-eights of its circumference. which, coming in contact with either of the projections, forces its spring against a binding post. From each of these four posts an insulated wire returns to the battery through an electro-magnet.

The north and south magnets are placed on opposite sides of an armature carrying a pencil. A second pencil is controlled by the east and west magnets and rests by the side of the first on a cylinder carrying a tape and revolved by clock-work.

The pencils are held in place, when the circuit is broken, by springs on opposite sides, which are attached by threads to the armature and also to winding posts at each end of either spring. In this way the spring is prevented from pulling the armature past the center.

The velocity and direction of each mile is thus recorded to eight points of the compass.

THE WINDS THAT BRING OUR RAINS.

BY A. W. BROWNE, U. S. SIGNAL SERVICE OBSERVER, LEAVENWORTH, KAS.

As that ancient and time worn theory which claims that "the amount of rain that falls in Kansas is entirely dependent upon the snowfall in the mountains" is again brought before the public by its few supporters, the signal service will give below in the light of facts the result of ten years' systematic observations in the Missouri Valley.

The prevailing wind for each year, during the past nine years, has been south, as will be shown by the following table:

* A Paper read before the Kansas Academy of Sciences.

PREVAILING WIND FOR EACH MONTH IN THE YEAR.

	1872	1873	1874	1875	1876	1877	1878	1879	1880	1881
January	NW	N	S	NW	S	S	N	S	S	N
February	S	NW	S	NW	S	N	N	S	S	NW
March	NW	S	N	NW	NW	S	NW	N	N	NW
April	S	N	N	NW	S	N	S	SE	S	N
May	S	S	S	S	S	S	S	S	S	SE
June	S	S	S	S	S	S	S	S	S	S
July	S	S	S	S	S	S	S	S	S	S
August	S	S	S	S	S	S	SW	S	S	S
September	S	S	S	S	S	S	S	S	S	S
October	S	S	S	S	S	N	S	S	S	S
November	NW	N	S	N	NW	NW	N	S	N	
December	N	N	S	S	NW	NW	N	S	N	

The above is determined from seven observations each day, and at the close of the month the number of times the wind was observed blowing from each direction is summed up, and the direction having the greatest sum is the prevailing wind for the month.

It will be seen that the prevailing wind for eight months of the year is south. This prevailing wind generally extends uninterruptedly from April to November, or during the season of the greatest rainfall. The prevailing wind during the winter months is from northwest to north. Notwithstanding that it has been asserted recently that the prevailing wind during spring and summer was southwest, there is only one instance during the past nine years where the prevailing wind for any month in the year was southwest, viz: August, 1878.

The following table gives the rain and dry winds for the Missouri Valley for each month in the year:

MONTH.	RAIN WINDS.	DRY WINDS.
*January	N E or N W	W or S
*February	N E or N W	W or S
*March	S or E	N W or S W
April	S or E	N W or S W
May	S W or S E	N W or S W
June	S W or S E	N W or S W
July	S or E	N N W or W S W
August	S or E	N W or S W
September	S or E	N W or S W
October.	S or E	N W or S W
*November	N E or N W	W or S
*December	N E or N W	W or S

* Or Snow during these Months.

These winds have been determined by taking each and every rain or snow storm that has occurred during the past ten years and noting the direction of the wind for three observations preceding; the direction during the storm and for three observations following it.

The table shows that the winds that bring our rain, eight months of the year, (from March to October) are southerly, while the dry winds are from northwest to southwest, the mean being west which is the location of the mountains from here Invariably during the winter months, (the season of the smallest precipitation) northeast to northwest winds bring our rain and snow storms, whilst the dry winds are from west to south.

Furthermore, if the "Rocky Mountain rain theory" is correct and the greater portion of the snow is absorbed, why does not Western Kansas have more rain than the Eastern portion of the State, as it is in closer proximity to the mountains: also what causes the annual June rise in the Missouri River?

Much stress has been laid upon the fact of some old bridges being but ten feet over the beds of streams in the mountain slopes as an evidence that the melting snow mainly passes off with the air; this may be true in a few isolated cases, but we know that an immense volume of water goes down the Missouri River every summer, to the Gulf; one of the most remarkable instances of which is fresh in the memory of every one, viz: the great flood of last April. The cause of this rise is well known to have been the melting of the snow in the mountains. This vast amount of water according to natural laws must return by some source, which is evidently the atmosphere, otherwise this section would become an arid desert.

In conclusion, I will cite two cases of recent date to disprove the "snow theory." At the close of the winter of 1879–80 but little snow remained unmelted in the mountains, there being but four inches on the summit of Pike's Peak; still the rains during the following spring and summer (1880) were in general up

to the average, and notably during July and August excessive. The snowfall during the winter of 1880–81, as every one remembers, was the largest known for years, and the rainfall during the spring and summer just closed was about one-half the average; in consequence of which the ground was scorched and the grass and growing ctops completely burned up in many instances, which would not have been the case if the snowfall in the mountains governs the amount of rain that falls in Kansas.

WHAT IS AN INCH OF RAIN?

An inch of rain is that quantity which, falling upon a level surface and not absorbed or allowed to run off would stand one inch in depth. The amount of water falling on one acre of land when the rainfall is one inch, would astonish any one who has given no thought to the subject. On each square foot of surface there would be 144 cubic inches, and on one acre, which contains 43,600 square feet, would be 6,272,640 cubic inches, which, reduced to imperial gallons, each containing ten pounds avoirdupois, would be 22,623 gallons, or 226,230 pounds, something more than 113 tons weight to the acre. The average annual rainfall in this locality approximates 50 inches; consequently, each acre receives 5,655¾ tons weight of water in a year. This amount of water would require a train of 565 freight cars to carry it. If one had to water a 640 acre farm at this rate, it would require figures like those of the distance to the nearest fixed star.

MEDICINE AND HYGIENE.

THE USE OF POWERFUL REMEDIES.

BY J. B. MORRISON, M. D., MARYVILLE, MO.

There is a class of remedial agents used pretty extensively in the practice of medicine, which agents are so potent, so very powerful in their influence upon the animal system, that their use in the hands of practitioners generally, is beginning to create considerable apprehension. The class referred to is that denominated narcotics or arterial sedatives, such as Veratrum Viride, Aconite, Gelseminum, Prussic acid, etc. It may be said at the outset, that these powerful agents are not without their excellent qualities and their usefulness, when carefully and properly handled; but a little negligence in the administration of them, may prove to be a very serious, and, I may say terrible, thing. As a rule, the human family value life very highly; too highly to have it jeopardized by carelessness or by over-confidence of those who assume, or are authorized, to take upon themselves the protection of the same.

These agents are so overwhelmingly powerful, that their administration, in one-drop doses, has to be watched by a careful physician or by an experienced and conscientious nurse, with a scrupulous vigilance. When we reflect that there are many careless physicians in the practice of medicine, not wanting in learning, and not without the inevitable sheepskin, authorizing them to "fall on," as well as very many *home-made* physicians who "fall on" without authority; and when we reflect that this class, or these classes, are just as apt to be upheld by the secular press as those who are not only possessed of honorable and honored diplomas, but who are also careful, vigilant, assiduous, conscientious, and life-respecting. I say, when we thus reflect, the question may well be asked, should not such treacherous or dangerous agents be set aside.

A gentleman was once asked if he thought all men would go to Heaven. His answer was, "yes, if you allow me to select the men." I may be asked if I would not allow or sanction the use of these remedies under any circumstances. I answer, yes, if you will allow me to select the physicians and the nurses. I am aware that these very articles of which I am apprehensive are used with excellent effect in hospitals and in many families where the physicians are within a few minutes' call and the nurses well trained and vigilant from necessity; but it is a patent fact that the great majority of the sick are not thus fortunately placed.

Since beginning the practice of medicine (1861), I have seen a number of cases in counsel where the patients died, I firmly believe, from the injudicious use of these agents—especially aconite—and not from pneumonia or other diseases. Experience of this kind, long since determined me not to use them except in very rare instances and then only under very strict guard. The result is that I have seldom made use of them in practice, nor do I now use them, and yet I think that I can show as favorable results in practice as those who use them—even if they lose but one patient in five or ten years by their accidental or otherwise misuse. There are much safer remedies that will fulfill the same indications, and why not use them? especially as the doctrine of specifics has but few advocates at the present day. If they were used on account of some well authenticated specific effect, there would be the more excuse for employing them and running the risk of accidents; but they are not used on such accounts, but are simply selected from a class to fulfill general indications. Some years since, an acquaintance of mine, was attacked by a threatening cold and cough, so threatening that he very early resorted to remedies, and in the cough mixture that he used he had incorporated some dilute hydrocyanic acid. He was not so careful as he should have been about taking the doses, and soon he was attacked with irregular heart-action, so that he became alarmed and sent for neighboring hypsicians.

Aconite, in very small doses, has an effect on many persons that is very disagreeable, if nothing more, and that effect is a constant and very annoying swallowing—a very peculiar sensation in the throat, that causes constant deglutition. This probably is an idiosyncrasy with many persons, as it unmistakably is with myself, and wise physicians will respect idiosyncrasies. The advice of "the fath-

er of medicine" is not sufficiently heeded at the present day, *i. e.*, "if you can do no good, be sure that you do no harm." There is too great a desire among the young disciples to find something new, something that the old fathers knew nothing about; but in my humble judgment, it is pretty difficult to do. The fathers have told us that these remedies are uncertain in their action, and dangerous. Every now and then we see an account in the medical journals of a case, or cases, of poisoning from the use of these deadly articles. Whilst physicians should guard against becoming old fogies, they at the same time should be careful not to rush heedlessly into customs or habits that will endanger the lives of the people. They should aim to steer between the rock and the whirlpool.

CHECKING THE SPREAD OF SCARLET FEVER.

The very notable experiment which was tried by Dr. Ashby, Medical Officer of Health for Grantham, England, in dealing with the summer outbreak of scarlet fever in that town, has deservedly attracted much attention. The plan resorted to was that of isolating the patients in tents. He prevailed upon the local authorities to erect a tent hospital on the outskirts of the town, and induced parents to send their sick there; the result was most successful. Parents availed themselves of the tents largely—their early prejudice against any such arrangement being readily overcome—the patients did remarkably well and the spread of the disease was unquestionably much curtailed.

HYGIENIC CONDITIONS OF COAL MINES.

Some interesting information as to the way in which the human system is affected under the peculiar conditions of work in mines, has been furnished by M. Fabre, from experiences connected with the coal mines of France. He finds that the deprivation of solar light causes a diminution in the pigment of the skin, and absence of sunburning, but there is no globular anæmia—that is, diminution in the number of globules in the blood. Internal maladies seem to be more rare. While there is no essential anæmia in the miners, the blood globules are often found smaller and paler than in normal conditions of life, this being due to respiration of noxious gases especially where ventilation is difficult. The men who breathe too much of the gases liberated on explosion of powder or dynamite suffer more than other miners from affections of the larynx, the bronchia and the stomach. Ventilation sometimes works injury by its cooling effect.

SALT AS A PROPHYLACTIC IN DIPHTHERIA.

In a paper read at the Medical Society of Victoria, Australia, Dr. Day stated that, having for many years regarded diphtheria, in its early stage, as a purely

local affection characterized by a marked tendency to take on putrefactive decomposition, he has trusted most to the free and constant application of antiseptics, and when their employment has been adopted from the first, and been combined with judicious alimentation, he has seldom seen blood-poisoning ensue. In consequence of the great power which salt possesses in preventing the putrefactive decomposition of meat and other organic matter, Dr. Day has often prescribed for diphtheric patients living far away from medical aid the frequent use of a gargle composed of a table-spoonful or more of salt dissolved in a tumbler of water, giving children who cannot gargle a tea-spoonful or two, to drink occasionally. Adults to use the gargle as a prophylactic three or four times a day.

GAS TREATMENT OF WHOOPING-COUGH.

In the treatment of whooping-cough in gas works, as lately resorted to, especially in London, the purifying chamber consists of a large room with doors and windows freely open, and each contains twenty-four vessels, holding five cubic meters of depurating substance—lime and sulphate of iron mixed with sawdust—through which the gas has to pass. When the workmen are emptying and refilling these vessels, the children with whooping-cough are placed around it, and inhale the vapors which escape; they are in an atmosphere containing ammonium sulphide, carbolic acid and tarry products. As to the efficiency of this treatment, one physician reports that of 120 cases persevered with, in twenty there was entire failure, forty-eight showed improvement, and the rest were cures; it is thought, however, that it acts only upon one element of the malady, viz., catarrh.

BOOK NOTICES.

THE AMERICAN CYCLOPÆDIA. Entirely revised and fully illustrated, with maps and engravings, 16 volumes octavo, D. Appleton & Co., New York. For sale by L. B. Bailey, Kansas City, general agent for Western Missouri.

About a quarter of a century ago the Messrs. Appleton commenced the publication of the New American Cyclopædia, having for its design "to furnish a condensed exhibition of the present state of human knowledge on the most important subjects of inquiry." Its editors were George Ripley and Charles A. Dana, aided by nearly one hundred collaborators in America, Great Britain and Europe. The work was conducted so ably and impartially that it speedily achieved the greatest popularity of any ever published in this country. It was virtually a library in itself, and its fortunate owner had little need to consult any other work of reference.

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We have had it constantly at hand for years, beginning in 1858, and have found it of the greatest use in our studies and in our literary and scientific work at all times. At the close of the series—sixteen large volumes—it was found necessary, in view of the great progress made in all branches of learning, and especially on account of the important political and military events transpiring at the time, to commence a series of Annual Volumes; consequently, from 1861 to 1875, each year furnished abundant matter of value in history, geography, science, biography, etc., etc., for a volume, similar in size and arrangement of contents to those of the Cyclopædia.

This work was regarded at the time of its inception, and has been ever since, as a marvel of condensed learning and an inexhaustible source of information; but the wonderful developments and discoveries of the past twenty years have rendered a new edition necessary. The whole has been thoroughly revised under the direction of the original editors, Ripley and Dana, by a corps of learned associate editors and revisers who have brought it fully abreast of the times. The new work, although the word "new" has been dropped from its title, is incomparably complete in every department, and is copiously illustrated with engravings and maps by the most skillful engravers. It is just what is needed by every intelligent family, as well as by professional men and students, and it has received the highest encomiums from the most distinguished scholars and scientists of the country. By no means the least of the attractions of the Cyclopædia is its cheapness. It is printed on excellent paper and bound in the most substantial styles, and yet, as the publishers say, it is "furnished to purchasers at less than one cent per page." To those owning the first edition the publishers offer exceedingly liberal terms for exchanging, and to those who cannot afford to exchange, the Annual volumes are supplied and delivered at intervals to suit.

Mr. L. B. Bailey is the authorized agent of Messrs. Appleton & Co., for Western Missouri, and is ready to fill all orders, and receive applications for subagencies.

THE MUSEUM OF ANTIQUITY. By L. W. Yaggy, M. S., and T. L. Haines, A. M,; 944 pp., octavo, Wever &. Co., Kansas City and Chicago, 1880. For sale by R. Mathews.

It is unusual to find in a subscription book so many good qualities as are combined in this work. The print, paper, illustrations and binding are excellent, substantial and tasteful, but the contents and style are its chief claim upon the reader's attention. Of the first it is only necessary to say that the antiquities of Egypt, Greece and Italy, including Troy, Nineveh, Babylon and Pompeii, are fully and graphically described and illustrated, together with accounts of the domestic life, amusements, domestic utensils, employment, religion or mythology, fine arts and literature of the people, condensed from the writings of the discoverers themselves. Of the second, the reputation of the authors as scholars and writers is a sufficient guaranty.

The works of Layard, Wilkinson and other archæologists and discoverers have been drawn from liberally, as well as the museums of London, Berlin and Naples; while days were spent at Pompeii in investigating those wonderful ruins. All points of any interest to the reader are taken up and fully discussed, the result being that almost all facts that the student of any of these subjects could need, and which would cost him hours and perhaps days of labor to look up in the different authors, are brought together in one convenient volume and set forth in an attractive and reliable form.

Nearly two hundred engravings illustrate the text, most of which are new, giving the reader a clear idea of all the noted ruined temples, statuary, domestic utensils and weapons of the ancients.

The work is for sale by Mr. and Mrs. R. Mathews, who have the general agency for Kansas City.

ARCHÆOLOGY. Vol. VII of the U. S. Geographical Surveys; quarto, pp. 497; Government Printing Office 1879.

We are indebted to Professor F. W. Putnam, curator of the Peabody Museum and editor of the above named work, for the copy before us. It is a magnificent volume, printed in the finest style and illustrated with a frontispiece sketch, twenty plates and one hundred and thirty-five text cuts. The contents of Part I are the General Report of Professor Putnam upon the Archæology and Ethnology of Southern California; the report of Dr. H. C. Yarrow, U. S. A., upon Chipped Implements; of C. C. Abbott, upon Mortars and Pestles, Steatite Cooking Pots, Plates and Food Vessels; on the method of manufacture of Soapstone Pots, by Paul Schumacher; on Articles made of Wood, and on Smoking Pipes of Stone, by C. C. Abbott; on Perforated Stones, (such as hammers, spindle whorls, weights for digging sticks, net sinkers, etc.,) of California, by the editor; on Miscellaneous Objects made of Stone, by C. C. Abbott; on Implements and Weapons made of Bone and Wood, by C. C. Abbott and F. W. Putnam; on Textile Fabrics, Basket Work, etc., and upon Ornaments, by the editor; on Beads, by S. S. Haldeman; on Iron Implements and other articles obtained by contact with the Europeans, by the editor; on the Crania from the Santa Barbara Islands, by Lucien Carr; Translation of the Voyage of Cabrillo along the Pacific coast in 1542, with introductory notes, by A. W. Henshaw.

Part II is devoted to the Pueblo Ruins and the Interior Tribes, by Prof. Putnam, and is mostly made up of the reports of G. Thompson upon the Pueblos and their Inhabitants, The Pueblo of Acoma, by Dr. Oscar Loew; The Pueblo of Taos, by Dr. H. C. Yarrow, U. S. A., and Lieut. Chas. C. Morrison, U. S. A.; The Pueblo of San Juan, by Dr. H. C. Yarrow, U. S. A.; The Cachina at the Pueblo of Zuni, by Francis Klett; The Ruins in New Mexico, by Dr. Oscar Loew; Ruins visited in New Mexico, by Lieut. Rogers Birnie, U. S. A.; The Remains of Population observed in Northwestern New Mexico, by Prof. E. D. Cope; Notes on the Implements of Stone, Pottery and other objects obtained in

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New Mexico and Arizona, by the editor; Classification in seven Linguistic Stocks of Western Indian Dialects contained in forty vocabularies, by Albert S. Gatschet. By this extended statement of the contents of this work, it will be seen that it is the most comprehensive and complete report on archæology yet made, and a most useful and desirable compendium. The engravings and cuts are exquisitely well done.

SPAIN AND THE SPANIARDS. By Edmundo De Amicis; octavo, pp. 438; G. P. Putnam's Sons, New York, 1881. $2.00. For sale by M. H. Dickinson.

This work, translated from the Italian by Wilhelmina W. Cady. comprises a series of sketches, handsomely illustrated, of the most celebrated cities of Spain, such as Barcelona. Saragossa, Burgos, Valladolid, Madrid, Aramjuez, Toledo, Cardova, Seville, Cadiz, Malaga, Granada and Valencia. These are all described with a sort of enthusiasm and power which recalls our school-boy idea of the Italian character and causes us to rebuild the "castles in Spain," which long ago vanished with other illusions of youth. Everything is seen by Amicis with eyes of admiration, and it is difficult to decide what pleases him most, the *senoritas* with their "great eyes full of sweetness," the cathredral of Burgos with its masterpieces of sculpture and painting, Valladolid, the Rich, with its famous picture gallery in the college of Santa Croce and its traditions of Christopher Columbus; the Prado, the Recoletos and other promenades of Madrid, its splendid theatres and cafes, armory and museums, its unsurpassable Royal palace, its bull fights, which he visited every Sunday, and to a glowing description of which he devotes thirty-one pages; its cock fights, which he did not enjoy; Toledo, perched upon its steep and rocky heights, and approached by the famous bridge of Alcantara, with its labyrinthine streets so narrow that the hubs of the wheels almost touch the walls of the houses, its ancient bas-reliefs, arabesques, Moorish windows and statuettes; Cordova, the ancient pearl of the East, the city of the thirty suburbs and three thousand mosques; Seville, the queen of Andalusia, the Spanish Athens, the city of poets and lore; or of famous Granada to whose magnificent promenade, the Alameda and ancient Arabian castle, the Alhambra, he devotes his most earnest and graphic descriptions. The whole book is bewitchingly interesting, both from the fascination of the subjects themselves, and also from the fine colors with which this Italian word-painter depicts them.

THE STORY OF A SCANDINAVIAN SUMMER. By Katharine E. Tyler; 8mo., pp. 394; Putnam's Sons, New York, 1881. For sale by M. H. Dickinson, $1.75.

Since Bayard Taylor recorded his observations and impressions of the Norse lands in 1857, in his book "Northern Travel," no American author has written anything on the subject until Miss Tyler gave her notes on Norway to the public under the above rather captivating title, and it must be admitted that there is con-

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siderable similarity in the manner of observing and describing the scenery, people and other objects of interest by these two writers; *i. e.* a kind of newspaperish style that is hardly satisfactory in the formal shape of a book. Nevertheless, there is much good and instructive reading in this volume, notably the chapters entitled "Down the Romsdal and Back," and "Up to the Midnight Sun," from the latter of which we make the following extract: "The sea was as clear and still as a mirror, reflecting all the lovely tints of mountains and sky. By and by we steamed out of the shadow; and as we passed beyond the dark mountain a few minutes before twelve o'clock (midnight) the sun was shining in dazzling splendor, apparently about two degrees above the horizon line of sea. It dropped no lower, but soon began to ascend gradually, appearing above the summit of the next mountain that interposed. The gentlemen greeted the sight with three cheers, adding another for 'Gamle Norge,' (Old Norway). Some of them tried to burn holes in their hats with glasses; and I think one of them succeeded after long labor, but there was not much heat in the rays. The effect of the golden light was wonderful, and the glaring reflection on the glassy surface of the sea from the North Cape itself, could hardly have been more glorious."

The book is filled with information regarding the mythology and ancient history of the Scandinavians, as well as the modern customs and habits of the Norwegians, and cannot fail to be of value to the reader. It is presented by the publishers in very handsome style.

MALARIA: WHAT IT MEANS AND HOW AVOIDED. Joseph F. Edwards, M. D., Philadelphia; Presley Blakiston, 1881; 12mo., pp. 81. 75c.

This little volume is divided into four parts, viz: What is Malaria? Where is Malaria found? Symptoms and signs of Malaria. How to avoid Malaria. The first chapter is devoted to showing the difference between Miasma and Malaria, and to impressing upon the mind of the reader that the latter is simply "bad air." The second proves that the atmosphere is contaminated in a thousand ways of which people generally are not aware, and points out many of them. The third shows that the symptoms of Malaria are so manifold and various that it is impossible to enumerate them. The fourth declares that cleanliness of person, dwellings and streets, and purity of atmosphere and water, are the chief means of avoiding malaria.

THE ART OF SPEECH. Studies in Eloquence and Logic, by L. T. Townsend, D. D.; 18mo., pp. 269; New York, D. Appleton & Co. Cloth, 60c. For sale by M. H. Dickinson.

After quoting the definitions of eloquence, by various authors, ancient and modern, Dr. Townsend concludes that eloquence, as an art, is such a representation of thought in vocal, written and gesture language as is adapted to persuade. As a science, eloquence is the theory of the processes of so expressing thought

as to persuade. Eloquence is, therefore, the art and science of persuasion. Oratory, as an art, is such an exercise of rhetorical skill in oral discourse as is imposing and impressive. The science of oratory is the classification and systematic arrangement of the rules of oratorical art. Oratory is, therefore, the art and science of producing strong impressions by means of oral speech. Eloquence, strictly speaking, generates volition; oratory generates conviction. On this foundation the author builds his work, beginning with the history of eloquence and leading off into its various departments, with illustrations from Demosthenes, (whose Oration on the Crown he analyses fully,) Cicero, Chalmers, Brougham, O'Connell, Webster, Choate, and many other recognized orators. His "Inferences" are admirably drawn and stated, and as a book of instruction in the theory and frame work of oratory, the Art of Speech is a success.

TEXT-BOOK OF EXPERIMENTAL ORGANIC CHEMISTRY FOR STUDENTS. By H. Chapman Jones; 16mo., pp. 145; Van Nostrand & Co., 1881.

This book is not intended by the author as a text-book of organic chemistry, but merely as a laboratory companion for the student who wishes to follow this branch of science practically, as well as theoretically, and especially for those who have but a limited amount of time at their command. The peculiarity of the work is, that in every division appropriate typical experiments are suggested, so that the student who follows out these suggestions with any degree of care, will necessarily acquire a permanent knowledge of at least that particular branch. The subjects discussed thus experimentally, in Part I, are the Cyanogen Compounds, the Hydro-carbons and their more immediate derivatives; the alcohols, the ethers, the aldehydes, the acids, the ethereal salts. In Part II the Reactions and Detection of certain organic acids are pointed out; also the methods of detecting them by analysis.

The simplicity of the explanations and the experiments is the chief recommendation of the book, as it enables students to proceed with their work with very little assistance from professors or teachers. The practical character of the subjects discussed is another advantage to this class of students, who are more likely than others to need to apply their knowledge to the practical affairs of life.

OTHER PUBLICATIONS RECEIVED.

The cultivation of Pyrethrum and manufacture of the powder, use of Pyrethrum as an insecticide, Prof. C. V. Riley. Apportiontment under the 10th Census of the United States, with remarks, by Hon. S. S. Cox; Subjects and Questions pertaining to Political Economy; Usury Laws, their nature, expediency and influence, by R. H. Dana, Jr., David A. Wells and others, 10c.; Semi-annual Report of the Comptroller of the City of Kansas for six months ending June 30, 1881; Annual Report of the Board of Trade of Minneapolis, Minn., 1880; Re-

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port of Proceedings of Polytechnic Association October 29, 1881, T. D. Stetson, President; Ephemeris of the Satellites of Mars, for the Opposition of 1881, Prof. H. S. Pritchett, Washington University, St. Louis, Mo.; Rules of the Probate Court of Jackson county, Mo., Judge O. P. W. Bailey.

SCIENTIFIC MISCELLANY.

UNVEILING OF THE MUDGE MONUMENT.

JOSEPH SAVAGE, CHAIRMAN OF MUDGE MONUMENT COMMITTEE.

The ceremonies of unveiling the Mudge monument were performed, with appropriate exercises, at the grave of the late Prof. B. F. Mudge, in the cemetery grounds at Manhattan, Kansas, on the 12th ult.

Quite a large delegation of members from the Academy of Science arrived in the city on the night train to take part in these interesting exercises. The day was bright and beautiful—almost a copy of the Professor's last on earth, the second anniversary of which occurs nine days later. Carriages were kindly furnished by the citizens of Manhattan to convey the visitors and friends to the grounds, which are situated upon an eminence, one and one-half miles from the business part of the city. The procession was formed at 10 o'clock A. M. in front of the Adams House, and was led by the family and friends of the deceased, the Odd Fellows, who were out in full regalia, forming an escort upon either side.

At the cemetery grounds, quite a large assembly had collected from the surrounding country to share in these dedicatory exercises. Prof. J. T. Lovewell, of Washburn College, President of the Kansas Academy of Science, called the meeting to order; and, by a few well chosen remarks, introduced the exercises of the occasion. He referred to the many years of labor in the fields of scientific exploration that the deceased had bequeathed to the State; to the debt of gratitude due him for all these services; that this monument, with its spire pointing heavenward, not only gave expression to this feeling, but was here to tell future generations that here lies the dust of him we loved, revered and honored.

Mr. Joseph Savage, of Lawrence, was next called upon to represent the State University and his section of the State. He spoke of his long acquaintance with the deceased, as companion, friend and teacher, and alluded to the first idea of a monument, which came to him almost two years ago like an inspiration; and also of the cordial support the friends of the project had everywhere received; the joy all must now feel at the completion of this "labor of love," now so beautifully represented in the monument before us—tears crystalized in marble.

Mr. Savage was followed by Hon. I. T. Goodnow, of Manhattan, in a de-

scription of the plan of the monument, its form, its various kinds of stone, and their colors and combinations.

It is composed of seven pieces. The lowest base is Dunlap, Morris county, light-colored limestone, representing his adopted State—the home of his riper years The next base is red beach granite, from Maine—the State of his birth. The third base is gray granite from Barre, in the Green Mountain State. The fourth base is a beautiful dark Quincy granite, from Massachusetts—the State where he was educated and grew up to manhood, his parents moving there in his infancy. The fifth stone, the die, is a beautiful variegated, light-colored marble, with pinkish tinge, and narrow, dark zigzag lines running through it. The sixth stone is a dark-colored La Panto marble with dark red spots, a rare stone from Rutland, Vermont. The seventh stone or shaft is marble from Knoxville, Tennessee—the same as the die—in all making the whole monument fifteen feet eight inches in height. The monument in form and color has elicited almost universal approval, with little if any adverse criticism.

Mr. Goodnow was followed by Rev. R. D. Parker, of Manhattan, who said that it was within the circle of these hills, that the deceased in company with his brother, J. D. Parker, now at Kansas City, Mo., first conceived the idea of forming the Kansas Academy of Science, which, for the last fourteen years, has been an accomplished fact.

Rev. E. Gale, of Manhattan, followed in some interesting remarks, contrasting the scenes which must have occurred in the "long ago," around a burial mound upon yonder hill-top, (Bluemont, probable burial place of mound-builders, and scene of Prof. Mudge's last geological labors,) with the exercises of the present time. Prof. Gale was for many years an associate teacher with Prof. Mudge in the Agricultural College.

Prof. Robt. Hay, of Junction City, claimed the right of being a lover of geological science, and as a co-worker in this great field of discovery and exploration, he would offer his tribute of love and praise to the memory of our departed friend. He also offered a resolution of thanks to Mr. W. S. Reed, of Lawrence, Kas., the builder of the monument, for his fidelity and faithfulness in performing his part of the contract so well. The resolution was unanimously adopted. Mr. Reed is rapidly rising in his vocation, and the monument demonstrates his skill.

Mr. Savage, upon request, gave a short explanation of the quotation put upon the monument, viz: "There is a Land that is Fairer Than Day." He spoke of the intense pleasure scientists all feel in finding something new in nature —a pleasure almost akin to a new creation. His own heart had throbbed in unison with Prof. Mudge's on many occasions of this kind, and he readily recalled to mind the unvarying habit of Prof. Mudge, upon finding anything new or old, of breaking forth into this song while unearthing his new found treasure. Therefore, the committee had thought it fitting to inscribe this couplet upon his tombstone: "There is a Land that is Fairer Than Day." Prof. Platt then suggested the singing of this hymn by the audience, which was done with evident feeling by all present.

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The benediction was then pronounced by Rev. R. D. Parker, and the audience dispersed, all feeling that it had been good for them to be there.

Rest, then, thou precious dust of him we so dearly loved, and sweetly sleep beneath this grass-covered mound, these fresh cut flowers, while at thy side this monument shall ever stand, pointing, with unerring fingers, to that "land that is fairer than day," where no light is, but where God is thy light.

THE DEMANDS OF THE MISSISSIPPI VALLEY.

The River Convention which met at St. Louis, last month, passed resolutions urging Congress to make a liberal appropriation for the improvement of the Mississippi. Since compliance with this request will benefit directly half of the States and more than half of the territory of the Union, it is but reasonable to suppose that it will be granted. The main argument in favor of it is concisely stated by the *Globe-Democrat* as follows:

The rivers of the Mississippi system pass through or border nineteen of the thirty-eight States, or just one-half of all, to say nothing of three great Territories, the Indian, Dakota and Montana.

Nor are these waters, even in the most remote communities, mere trout brooks, but navigable and actually navigated streams. Of the nineteen States tributary to the Father of Waters, fourteen are practically Valley States, having interests which are to a great extent under the River's influence. The others, as New York, Pennsylvania and Alabama, though sending important currents into the great central artery, are less affected by it. Among the Valley commonwealths proper are the great, central and rapidly growing communities of Ohio, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, Nebraska and Kansas —States of more material value to the Union than any other nine that can be picked out.

The area of the nineteen river States is 1,208,977 square miles, while the nineteen non-river States count up only 855,752 square miles. Over 350,000 more miles of country contribute to the grand aqueduct than are comprised in all the rest of the United States. This surplus is enough to allow New York, Pennsylvania, West Virginia and Alabama to be thrown out of the list of river States altogether, with a good slice of Texas besides. The Mississippi basin, all told, including its headwaters in all the States and Territories, comprises a drainage area of nearly 1,260,000 square miles.

THE SONG OF THE CARBONS.

[The universal physical law of molecular vibration is finely illustrated in the carbon pencils of the electric arc light used in some of the largest lighthouses. The molecular stir set up in the armatures of the dynamo machines by rapid

magnetization and demagnetization is transmitted to the carbon points of the lantern, and reappears as a distinct musical tone.]

A weird, sweet melody, faint and far,
A humming murmur, a rhythmic ring,
Floats down the tower from where the lenses are
Can you hear the song which the carbons sing?

Millions of æons have rolled away
In the grand chorale which the stars rehearse,
Since the note, so sweet in our song to-day,
Was struck in the chord of the universe.

The vast vibration went floating on
Through the diapason of space and time,
Till the impulse swelled to a deeper tone
And mellowed and thrilled with a finer rhyme.

Backward and forward the atoms go
In the surging tide of that sounding sea,
Whose billows from nowhere to nowhere flow,
As they break on the sands of eternity.

Yet through all the coasts of the endless All,
In the ages to come, as in ages gone,
We feel but the throb of that mystic thrall
Which binds, responsive, the whole in one.

We feel but the pulse of that viewless hand
Which ever has been and still shall be,
In the stellar orb and the grain of sand,
Through nature's endless paternity.

The smile which plays in the maiden's glance,
Or stirs in the beat of the insect's wing,
Is of kin with the north light's spectral dance,
Or the dazzling zone of the planet's ring.

From our lonely tower aloft in air,
With the breezes around us, tranquil and free,
When the storm rack pales in the lightning's glare
Or the starlight sleeps in the sleeping sea,

We send our greeting, through breathless space,
To our distant cousins, the nebulæ,
And catch, in the comet's misty trace,
But a drifting leaf from the tribal tree.

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The song we hum is but one faint sound
In the hymn which echos from pole to pole,
Which fills the domes of creation's round,
And catches its key from the over-soul.

And when it ceases all life shall fail,
Time's metronome shall arrested stand;
All voice be voiceless, the stars turn pale,
And the great conductor shall drop his wand!

—*Springfield Republican.*

EDITORIAL NOTES.

DR. E. R. HEATH, the accounts of whose explorations in South America have been of so much interest to the readers of the *Review* during the past two years, has returned home. After reaching this country he delivered several lectures, descriptive of his travels and the regions he explored, in New York and Philadelphia, under the auspices of various learned societies. These lectures were well attended and highly appreciated by his auditors. He will remain with his brother Dr. Ivon D. Heath, at Wyandotte, Kansas, during the winter. His lecture before the Kansas City Academy of Science on the 29th ult. was delivered after the REVEIW for December was in print.

THE Kansas City Board of Education, having a nucleus of a public library numbering about 3,000 volumes, and a moderate fund on hand from individual donations, is enlarging its accommodations and is about to purchase a quantity of new books. This Library is becoming very valuable by reason of the good judgment exercised in the selections made heretofore, and if properly fostered and encouraged by the citizens, will, before many years, be the pride of the city.

PROF. L. A. THOMAS, formerly principal of the Topeka schools, died November 11th at his residence in Topeka, of quick consumption. Mr. Thomas was an educator of rare ability and possessed many traits of character that greatly endeared him to those with whom he was associated. His loss is one that will be keenly felt in the educational ranks of the State.

PATRONS of the *Review* will please remember that they can procure all of the periodicals of the day at 15 per cent below the regular subscription rates by ordering through this office. Also any book published by any of the prominent publishers, at 20 per cent below retail prices.

PROF. S. W. BURNHAM, the noted astronomer of Chicago, passed through this city on the 23d ult. on his way from California, where he had been for the past month in company with Professor E. S. Holden, of Madison, Wisconsin, visiting and inspecting the Lick Observatory, and observing the transit of Mercury.

PROF. ERNEST INGERSOLL, of the United States Fish Commission, made a brief call at this office on the 22d ult. He has been, for several months past, engaged in exploring the ancient ruins and other objects of interest along the line of the Denver & Rio Grande Railroad in Colorado and New Mexico. The results will soon be published in a handsome illustrated volume, and will, doubtless, meet with a ready sale.

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JUDGE E. P. WEST, who has contributed several valuable archæological articles to the *Review*, in the past, is now engaged in an exploration of the Mound Builders' works along the banks of the Missouri river between here and Jefferson City, in the interest of the Daily *Times*, to which paper he sends an interesting report of his labors weekly.

BY a typographical error the word "Miso" in Professor Penhallow's article in the November *Review*, was misspelled "Meiso"; and in the second line of page 437 the word "rice" should be substituted for "miso."

A COMPANY has been formed in St. Louis for the purpose of manufacturing and supplying hydrogen gas for heating and power for dwellings and factories. The gas is generated under the Law process, which has been successfully applied in several eastern cities. The works are the largest and most extensive in the country, and when in operation will have a capacity of 300,000 cubic feet per bay. The gas is not adapted for illumination, and will only be supplied to tenants requiring it in place of coal for raising steam in ordinary boilers and for running gas engines, in which work it is superior to coal gas, furnishing greater pressure and only at a cost of $1.50 per 1,000 cubic feet.

The process can be briefly illustrated, as follows: Anthracite coal is fed to an upright generator, where it is worked up to a white heat by the agency of a blower, which is driven at a high rate of speed by a fifty-horse-power engine. As soon as the coal arrives at the proper heat, super-heated steam is admitted, and, impelled by the pressure of the blast, passes through the furnace and thence through super-heating chambers and carburetters. In the passage the generated gas is washed, and after passing through a series of tile pipes is return ed to the condenser ready for distribution to the consumer. The surplus supply is conducted to a gas holder in the yard which has a capacity for storing 30,000 cubic feet. The power required in manufacturing the gas is supplied by a sixty horse power boiler and an ordinary engine of the same power. After operations begin the steam engine will be supplemented by a gas motor.

Connections will be made with manufactories through ordinary fifteen-inch iron pipes, which will be laid underground in the same manner as gas pipes. For private houses and hotels, where the gas will be used as fuel, smaller mains will be employed. The condensation is so slight that it is not considered necessary to encase the pipes in asphaltum, cement or any other non-conducting materials, and it is claimed that an efficient service will be obtained by these means.

GENERAL SHERMAN makes the very sensible suggestion in his annual report that the President authorize the transfer, out of class-enlisted men who have served for twenty-five years or more, a number not to exceed 500, including ordnance sergeants (now 112) and establishing a "veteran corps," to be stationed at such old forts as are worth preserving, with the rank and pay they held at the close of their active career in the army service, to be subject to the rules and articles of war, but only to be used for guarding public property. He says one or two officers of the retired class and half a dozen of these old soldiers would compose a good garrison for an abandoned post or fort. By granting retired officers thus detailed, fuel and quarters, we would provide homes for worthy veterans, which would be most honorable and creditable to them and advantageous to the government. At the same time the army proper would be relieved from such duty, and its able-bodied men put at their legitimate work in the field.

EXTENSIVE zinc smelting works are being erected at Rich Hill, in this State. They are to occupy thirteen acres of land, and will comprise seven large buildings, costing $50,000.

THE National Academy of Science met in the hall of the University of Pennsylvania, in Philadelphia, on the 15th ult. Among other matters of importance was the appointment of a committee to conduct the observations of the transit of Venus in 1882.

SIGNOR ANGELO POSSI PONTI, after a long study of the peculiar geology of the petroleum region of Pennsylvania, concludes that the causes of the volcanic forces in Mt. Vesuvius are the same as those which produce the gases in the oil region, and proposes by boring near the mountain's base to draw off and utilize for mechanical purposes the vast accumulation of oil which has for ages been feeding the flames. He prudently offers to attempt it *after* stock to the amount of $500,000 has been subscribed and paid in for that purpose.

DR. HAHN'S discovery of fossil organisms in meteorites, has stirred up a lively discussion among the *savants*. Charles Darwin is reported to have declared his faith in their presence in the specimens presented for his examination, and pronounces the discovery a most important one.

THE State coal shaft, at Leavenworth, Kansas, is 732 feet deep, including a sump of nineteen feet, to catch the dripping water, which accumulates at the rate of sixty-five gallons an hour. The main shaft is 10x16 feet, and the air shaft, or up-cast, 4x10 feet.

The working face of the mine is about 1,200 feet long, and extends entirely around the mine at a distance of 125 feet from the shaft. There are at present forty-nine men working at the shaft, who are getting out about 1,200 bushels of coal a day.

THE suggestions made by Mr. W. L. Campbell, of this city, to the Missouri River Improvement Convention that met at St. Joseph on the 29th ult., were eminently practical, showing a careful study of the wants of the West and the best manner of meeting them. If adopted by the Convention and carried out by Congress our River will assume the commercial importance commensurate with its size and the immense country it drains.

WE call attention to the advertisement, in this number, of the Noyes' Dictionary Holder. It is an improvement upon anything of the kind that we have seen, not only in style and stability, but also on account of the attachments or racks for magazines, etc.

ITEMS FROM PERIODICALS.

THE December issue of the *Popular Science Monthly* is the second number of Vol. XX, which means that about ten years of the life of that most valuable and popular magazine have glided away already. In this time it has furnished its patrons more than 16,500 pages of the best untechnical scientific matter, original and selected, that has ever been offered the general reader in this country. $5.00 per annum.

This magazine, as well as all other prominent periodicals, can be procured through this office by subscribers to the REVIEW, at club rates.

THE *American Young Folks*, published at Topeka, Kansas, by Messrs. Longshore & Smith, was established in 1875, and is the best and cheapest periodical in the West for boys and girls. It is an eight page quarto, issued monthly, well edited, full of illustrations and furnished postpaid to subscribers for 50c per annum.

MESSRS. HOUGHTON, MIFFLIN & CO., have secured the exclusive control of the *Edinburg Reveiw* and the *Quarterly Review* in the United States. These, together with either of the other periodicals published by this well known house, viz: the *Atlantic*, the *Boston Medical Journal*, the *Law Reporter*, and *Dwight's Journal of Music*, can be obtained by subscribers to the Kansas City REVIEW OF SCIENCE AND INDUSTRY, at club rates.

WM. HOSEA BALLOU, of Evanston, Ill., read a valuable and comprehensive paper at the Cincinnati meeting of the American Association for the Advancement of Science, upon the White Pine, its origin, reproduction, insectivorous enemies, natural history and statistics of the industry. The matter furnished is well chosen and admirably condensed, making an article worthy of preservation.

The Evolutionist at Large, by Grant Allen, is the title of the Humboldt Library No. 26. Price, 15 cents. J. Fitzgerald & Co., New York.

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ONE of the best articles found in the Proceedings of the Kansas State Dental Association for 1881, just received, is that of Dr. R. Wood Brown, of this city, upon "Teeth and Brain," which was so well received by our Academy of Science last season.

THE *American Antiquarian and Oriental Journal*, Vol. 4, No. 1, T. H. Bush, Publisher, Chicago, Ill.; Rev. Stephen D. Peet, Editor, Clinton, Wis., presents this attractive table of contents; Prehistoric Europe, a summary, By L. P. Gratacap; Were the Mound Builders Indians? By D. G. Brinton, M. D.; Prehistoric Relics in Egypt, (a review of Brugsch Pasha's address,) By O. D. Miller; Legends of the Iroquois, By Mrs. Erminnie C. Smith; Polyandry in India, By Prof. John Avery; The Site of Capernaum, By Prof. J. Emerson; The Three Temples Compared—Greek, Hebrew and Egyptian, By Rev. S. D. Peet. Correspondence—Sea Shells in Mounds—Gentes and Phratres. Editorial Department—Oriental Congress, Mummies in Egypt, Siloam Inscriptions, Linguistic Notes, Oriental Notes. Recent Intelligence, General Review, Book Reviews.

WE have received from Prof. J. T. Lovewell, the catalogue of officers and students of Washburn College, Topeka, Kansas, for the year 1881–2. From it we learn that the institution is in a flourishing condition, and that it will graduate its first senior class this year. The course of study in all departments is full and thorough, and the means of illustration are unusually good. It is one of the best colleges in the west.

DR. STEPHEN BOWERS, who has been publishing the *Weekly Herald*, at Clinton, Wis., has purchased the office of the *Beloit Outlook*, Beloit, Wis., where he will edit and publish the Daily and Weekly *Outlook*. The *Herald*, under his management, has been a success, and this still wider field will, doubtless, prove more successful.

THE *Atlantic Monthly*, for December, presents the following choice table of contents: Dr. Breen's Practice, 11, 12, W. D. Howells; Origin of Crime in Society, 2, Richard L. Dugdale; Shakespeare and Berlioz, Theodore Child. The Portrait of a Lady, 53, 55, Henry James, Jr.; The Parting of the Ways, W. C. L.; The Habitant of Lower Canada, Edward Farrer; British State Assassins and the Defense of Insanity, James W. Clarke; Hester's Dower, S. A. L. E. M.; Socialists in a German University, Willard Brown; At Canterbury, Harriet W. Preston; Caste in American Society, Kate Gannett Wells; Pyrrhus' Ring, Edith M. Thomas; East of the Jordan, and other Books of Travel, Charles G. Leland; Buddha and Early Buddhism; Mark Twain's New Departure; The Contributors' Club; Books of the Month.

WEEKLY OUTLOOK.

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